JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXIII., No. 2487.—TUESDAY, JANUARY 10, 1911.

EDITORIAL NOTES—GAS, &c.

Ammonia Recovery from Gas Coke.

WE welcome, and welcome right heartily, the return of Mr. F. D. Marshall to the fields of active technical conference; for he is always refreshing, even in his most serious moods—it being characteristic of him to be original in both matter and style of presentment. But for some time his voice has been unheard among his old colleagues, and the fruits of his pen have not been seen in the place where of yore they were occasionally to be found. He comes among us again, however, through his good nature having taken him to Manchester last Saturday to fill a breach in the course of lectures at the Manchester University; and the students of the technical and commercial affairs of the gas industry who were privileged to be present on the occasion heard Mr. Marshall in the old spirited form, and with the customary vein of originality running through his lecture.

With the main part of his deliverance, we shall deal but briefly, as it requires all that Mr. Marshall has to say—not perhaps to appeal and incite to thought, but to show that, at all events, there is something more in what he urges than the gossamer ideas of the mere dreamer. We will accept the lecturer's assertions as to the craving of Mother Earth for more nitrogen, and get at once to the capital feature of the address. He declares that those gas undertakings that are producing an average of 30 gallons of 8-oz. liquor per ton of coal carbonized are, having regard to the nitrogen content of the coal used, incurring an average theoretical loss of 170 gallons of 8-oz. liquor per ton, containing (say) 1·5 per cent. of ammonia. The loss is therefore equivalent to 5·2 tons of sulphate of ammonia per 100 tons of coal carbonized, compared with the actual and relatively poor yield of a ton or rather more per 100 tons of coal. If we could count the 5·2 tons as a "bird in the hand" with the ton or so actually obtained per 100 tons of coal carbonized, the British statutory gas industry in 1909 would have been the happy—providing a market at good prices had been open to it—producers of about 915,000 tons of sulphate of ammonia, instead of the 164,276 tons that Mr. R. Forbes Carpenter, in the final report he issued as Chief Inspector under the Alkali Works Regulation Act, stated to be the positive output by the gas undertakings in that year. The wealth of gold that the theoretical loss represents can be readily calculated according to the personal inclination of readers, and their views as to the effect of the increased production, until demand was stimulated to a countervailing degree, upon market values. In passing, however, there may be reminder that Mr. Ferranti, in his recent Presidential Address to the Institution of Electrical Engineers, was sketching a plan for flooding the country with electricity from the pithead at an average price of ⅛d. per unit, and that in the main the financial structure and success of the material embodiment of his vision rested on the sulphate of ammonia product from the carbonization of 60 million tons of coal per annum required for generating the electricity. Mr. Ferranti had taken credit for a production of no less than 5 tons of sulphate of ammonia per 100 tons of coal! The gas industry should take Mr. Ferranti into its confidence.

But where does this nitrogen go to that is not recovered in the present system of coal-gas manufacture? Mr. Marshall is of opinion that it can only exist in the coke and breeze. We think he gives too much credit to the coke and breeze in this particular. Professor William Foster was nearly thirty years ago studying this question of the distribution of the nitrogen of coal among the several products of destructive distillation; and in Butterfield's "Gas Manufacture and Assay of Bye-Products," the results of the Professor's researches are placed on record. "He concluded that in ordinary gas manufacture, of the total nitrogen in the coal 14·5 per cent. is evolved as ammonia, 1·56 per cent. as cyanogen, while 48·68 per cent. remains in the coke. There is still 35·26 per cent. as free nitrogen in the gas or contained in the tar, but the amount in the latter is considered to be relatively small." But although Mr. Marshall may have, in his enthusiasm in trying to locate the difference between the nitrogen profitably accounted for and that still at liberty, wrongly concluded that the nitrogen of the coal unrecovered takes refuge in one quarter, Professor Foster's figure of 48·68 per cent. in the coke is a sufficient foundation for his purpose. Before going further, however, it may be well to remind those who may be induced by the lecture to look into the matter, that the question of the loss of ammonia on gas-works was the subject of fertile controversy in the "JOURNAL" in 1883 and 1884; among the contributors being Greville, Foster, Humphrys, "Owen Merriman," Tervet, and Wanklyn. The idea that Mr. Marshall brings before us is adumbrated in one of Professor Foster's articles (May 20, 1884), when he says: "In heating 100 tons of coal in the manufacture of coal gas in the ordinary way, as much ammonia is recoverable as suffices to produce about 1 ton of ammonium sulphate. In the treatment of 100 tons of gas coke with steam, so as to gasify only a portion of the whole, and to allow for the remainder of the coke being used as fuel in the process, about 4 tons of ammonium sulphate can be produced." Mr. Marshall's suggestion to-day—nearly thirty years later—is that the coke should be treated for the recovery of the nitrogen that is given away with the coke or is uselessly consumed in the generators of retort-settings. But he admits, within the limits of our present knowledge, the impracticability of doing this except in a relatively small measure, until such time as gaseous fuel expels the use of solid fuel, and coke has to be utilized in making gas.

A start could, however, at once be effected in the larger gas-works by the use for heating retort-settings of outside producers and the application of ammonia-recovery plant. There is one correction that should be made in the lecture in this connection. Mr. Charles Carpenter will hardly desire to have all the credit of outside producers showered upon him, with those large outside producers which were the pride of the late Mr. William Foulis, standing at Provan. That only by the way. Mr. Marshall's proposal is the chief point—outside generators of a special type, with ammonia-recovery plant attached, for heating retort-settings; and he holds out the fascinating prospect of 80 to 85 lbs. of sulphate of ammonia being recovered per ton of fuel gasified. The financial balance-sheet that he presents, too, is a real and attractive work of art. For all the details, however, reference must be made to the lecture.

The difference between the lecturer and those who took part in the controversy in the early eighties is that they were suggestive, while Mr. Marshall has a concrete plan for giving effect to the idea. And this much may be said, that the case for a trial is established; but others besides ourselves will prefer to reserve judgment on the estimates until after that event. With, however, actual estimates submitted with guarantees by those concerned in the special plant, there is a proof of confidence on their part in the process. To say the least, Mr. Marshall, in this lecture, has furnished new interest and matter for fresh thought, and has certainly opened the door upon a possible additional economy in gas-manufacturing operations.

Extending Territory and Business Powers.

THE section of gas legislation for the forthcoming session treated upon in other columns this week refers to the promotions by existing statutory gas companies; and some of the provisions are more than usually interesting. Head and front among the measures stands the Bill promoted by the Gaslight and Coke Company. A few years ago it would have been impossible for this Company to have suggested altering their geographical bounds by annexing concerns operating upon their borders; and the impossibility then was due to the fact that the Company had no inducement

that they could offer the neighbouring Gas Companies or their consumers to come in. But the conditions have been transformed; and following West Ham, the Company are now, as our readers are aware, proposing to link-up the Barking and the Chigwell, Loughton, and Woodford Companies' areas and business to their own. The agreed terms on which this is to be done are set forth in our digest of the principal clauses of the Bill. Looking into these terms, it will be a querulous shareholder or consumer of the smaller Companies who will be disposed to cavil at the conditions on which transfer is to be made. The share or stock holders of the Companies will quickly find themselves in a stronger position than would have been the case by continuing in an independent state; and we rather fancy the holders of the 10 per cent. maximum original shares of the Barking Company will be exceedingly pleased to promptly compound at the figure named in the terms for all arrears of their dividend. The advantage of amalgamation will, through the reduced price of gas, be felt by the consumers of both Companies immediately the Act comes into operation; but there is to be a period of two years in the case of the Barking Company and four years in that of the Chigwell Company before price uniformity is attained with the existing Gas-light area. This is only fair.

Competition from private power and suction gas plants and from electricity has entirely changed the conditions that existed at the time of the passing of the Gas-Works Clauses Act of 1871; but the provisions of the Act which compel supply and inflict penalties for non-compliance, have not been in any way modified. It is patent, now that keen competition has come along, that the unqualified compulsory supply condition may work harshly on gas suppliers; and it is quite conceivable that there are circumstances in which the unconditional obligation to supply may, where use is only occasioned by some fortuitous occurrence, result in the jeopardizing of the supply to the constant users. The application of qualification is a feature of the Bills before us this week. For a long period, Parliament would not give to the gas industry the right willingly accorded to the electrical industry, to a sufficient remuneration for expenditure incurred in connection with what are properly known and termed as stand-by supplies. This has been altered in the past two sessions; and in the measures of Companies seeking incorporation (reviewed last week) and in those of statutory Companies (dealt with this week), there are several examples. In the review in subseqeent pages, we have the Enfield, Luton, Swansea, and Tamworth Companies asking for the right to proper compensation in respect of stand-bys. The Luton Gas Company seek the protection in respect of private gas installations only; while the other three Companies are desiring it in regard to both gas and electricity. We are of opinion that the latter are correct in wishing the clause to embrace the two chief forms of competition; and we also welcome the attempt that is made in the Enfield and Swansea Bills to fashion a clause comprehending both that is not so cumbrous as precedent. But the Swansea and Tamworth Companies are going beyond the stand-by clauses, and again rightly. They were not the first to make the proposals to which we are about to call attention; and what they suggest may be looked upon as a revival. It is not sufficient to protect the suppliers of gas in the matter of recompense for the expense to which they are put in providing a stand-by supply; but there is also the question of the protection of consumers against drafts from a main of insufficient capacity for purposes other than lighting, or a casual heavy consumption which, more likely than not, might come at the time of maximum demand by ordinary consumers, and so jeopardize the supply to the latter. The Swansea and Tamworth Companies now seek release from obligation to supply gas respectively under the circumstances named.

There is further interest in the Swansea Bill. The idea is one worth encouraging, that a gas undertaking should be the centre of a very comprehensive business in light, heat, and power. The Harrogate Company led the way in the session of 1909 with a clause empowering them to supply gas plants of any kind—acetylene, gasolene, and suction—or gas-engines, dynamos, &c., to premises distant from their mains. The Swansea Company are asking for the same power in their present Bill. The Enfield Company are including in their measure (as several Gas Companies have done before them) clauses to authorize the supply of power gas. The proposals all accord with the spirit of expansion that is abroad in the gas industry to-day.

Two or three miscellaneous, but notable, matters in the Enfield Bill also deserve special reference. The Company desire, among other things, to have it specifically laid down that they shall not be liable for any damages caused to any consumer by reason of the non-repair of any gas-meter, prepayment meter fittings, gas stoves, cooking, or other apparatus let by the Company on hire, unless notice of the want of repair has been given in writing to the Company, and they have neglected to rectify the defect within a reasonable period. The same Company are also following the Brighton Company in their success last session in obtaining permission to form a redemption fund for the purpose of cancelling a specific amount of existing capital. They wish to wipe out £40,000 of capital, by half-yearly appropriations not exceeding £500; and as soon as the extinction of the sum named has been accomplished, the power is to automatically determine. The Company further seek authority to redeem their 5 per cent. debenture stock, or else to substitute for it stock at a lower rate of interest. There are other minor interesting features in the Bills, but for them reference must be made to the general review.

Quality Test for Incandescent Mantles.

Incandescent gas lighting has had a firm hold in this country for the past quarter of a century or so; and it is passing strange that so far there has been no definite test devised here for mantle quality which could be adopted as a standard by large users and buyers, and which would give the makers a specification of requirement to which to work. Mantle manufacturers and large buyers—such as gas undertakings—have, of course, their own individual notions as to the character of test to which the mantles they respectively make and purchase should be subject; but there has been no general agreement as to, nor has the central professional organization of the British gas industry submitted a model of, a quality test that could have universal application. It is such a test as this that is wanted. Mr. J. H. Coste (Chief Assistant to Professor Frank Clowes, the Chemist to the London County Council) and Mr. W. E. F. Powney have felt the need of such a test; and they have been developing the lines of one, which they have submitted to the London Section of the Society of Chemical Industry, as reported in other columns this week. In passing, it may be submitted that a meeting of the Society is not a particularly suitable one for drawing out the most practical views on a subject of this kind; and we feel confident that the authors would have found more interest in regard to the question at, and derived more suggestion from, a meeting of the Institution of Gas Engineers than they did at Burlington House yesterday week. As a matter of fact, there was not a single gas man present to discuss the paper; and its consideration dropped on to somewhat commonplace lines, even to the example of trite jocularity of one of the speakers based on a somewhat ancient experience. The discussion was a most unprofitable one, excepting in so far as it helped to accentuate the neglect that the authors of the papers have discovered in connection with the topic in hand. It will, however, be seen that Messrs. Coste and Powney have settled upon the lines of a quality test for their own application; but they do not put their plan forward as a perfect thing, upon which others cannot improve. Their effort has been good. This is the result; and now they want the criticisms of competent people who believe that a mantle quality test is desirable, or the form of test that others may think preferable to their own. The need is an uncomplicated test that can be easily applied, and will not absorb too much time. It is recognized that a universally accepted test would have a considerable influence on mantle making and trading.

In connection with their test, Messrs. Coste and Powney first employ a shock machine, for weeding out bad makes from good in respect of strength, before applying the photometrical test. We are not disposed to give too much credit to the shock machines that have been produced for in any way reproducing the vibrations to which mantles are normally exposed in use. A metal built machine, with rigid support for the mantle, and with a cam or some other device producing a rapid succession of violent shocks (the authors, it is understood, expose the mantle to 200 of these shocks per minute), does not represent the normal conditions of the use of a mantle. The best that can be said for such a test is that it must represent the maximum of violence to which a mantle placed in the worst of conditions is likely to be subjected; and that if a mantle can survive several hundred

of these sudden, hard jerks, in rapid succession, then the mantle is worthy of our admiration and our patronage. But many a mantle that would not stand this sort of rough treatment, with, in the case of an upright mantle, a quick beating against the sides of the supporting burner would not necessarily have a short life with nothing more to meet than the tremors encountered in domestic service in any ordinarily built house. If such shock tests really represented the common experience of incandescent mantles, it would be a very bad look-out for the lighting business of the gas industry. We cannot for the life of us see why a mantle should be subject to a test that is, in all its characteristics, so much in excess of anything that can be regarded as the normal conditions of use. The majority of the hours in the life of a metallic filament electric lamp are passed with the filament in cold condition; and during all these hours, the filament is in its most critical state. But we have never heard of anyone suggesting that in that state the metallic filament lamp should be put on to a machine with an eccentric that would give to the lamp (say) 1000 violent jerks in five minutes. The electricity supply industry would have their gravity seriously disturbed if anyone came along with such a proposal. Some vibrating trial is useful as an index of the physical strength of mantles; but we cannot help looking upon the present means as somewhat drastic for deciding upon merit or condemnation.

There is one very interesting point emphasized by the paper of Messrs. Coste and Powney. It is the superiority of the inverted mantle from the life point of view in comparison with the vertical mantle. The public do not sufficiently appreciate the point. They do not appreciate that much of the failure of the upright mantle is due to the fraying of the skirt by even an almost imperceptible swaying against the burner top; while the inverted mantle escapes similar damage by hanging free from contact with anything. Many vertical mantles, however, have made, and will continue to make, excellent records. Atention was drawn, in the discussion at the November meeting of the Illuminating Engineering Society, to some good personal experiences with this form of mantle. But inverted mantles, under normal conditions in a household, register, as a rule, such excellent lives that it is difficult very often to remember, even approximately, the time when a mantle was put into service. But it is significant, as bearing upon this point, that Messrs. Coste and Powney have determined upon 1000 shocks for vertical mantles and 3000 shocks for inverted mantles as the lines which the mantles must respectively toe to be adjudged worthy of consideration in the next, or photometrical, stage of the test. The difference in the prescription is to the honour of the inverted mantle. But we wholly fail to see any logical reason for the inverted mantle being required to pass three times the number of shocks of the vertical mantle, when the structure of the mantle itself and the conditions of its use are so much more in favour of longevity than is the case with the vertical mantle. The test of an article should certainly have some relation to the character of its destined service.

In connection with the photometrical portion of the test, there were some remarks made in the discussion as to the falling away of the lighting power of mantles. Our electrical friends cherish some belief of apocryphal origin that, after a few hours' use, the illuminating power of incandescent mantles tumbles rapidly away. With "C" mantles, after burning 100 hours, Messrs. Coste and Powney found a remarkable agreement in efficiencies per cubic foot of gas consumed—consecutive results noted with different burners and mantles running between the extremes of 16·4 and 18·9 candles. The inverted burner sustains its illuminating power a greater length of time than the vertical one entirely through the structural differences of the burners—the dust-supporting gauze top of the upright burner is absent in the inverted burner, and the top of the gas-nipple (which also invites the lodgment of dust in the former) is inverted in the latter type. There are, it is seen, a good many points in favour of the inverted mantle; but, in designing a quality test, Messrs. Coste and Powney think it the right thing to, in consequence, severely handicap it. The whole subject of a mantle quality test is one that merits the fullest discussion.

Errors in Gas Calorimetry.

A SUMMARY of the points made by Messrs. J. H. Coste, F.I.C., and B. R. James, F.I.C., of the Chemical and Gas Department of the London County Council, in a paper on "Radiation Errors in Flow Calorimeters," which they read before the London Section of the Society of Chemical Industry last week, is given on another page of to-day's "JOURNAL." As there was little discussion on the paper at the meeting, it may be worth while to draw attention to a few points in the conclusions of the authors which seem to us to require revision or at least reconsideration.

Messrs. Coste and James appear to have concluded—from the fact that, if water at a lower temperature than the surrounding air is allowed to flow through a calorimeter in which the gas has not been lighted, the outlet thermometer will record a higher temperature than the inlet thermometer—that the water is necessarily absorbing heat from the exterior air, and that this absorption is due to radiation rather than to convection. They argue that, as a result of this supposed absorption of heat from the surrounding air, gas tested in a flow calorimeter of the Boys or the Junkers type will be credited with a higher calorific power than it does actually possess if the test has been made with water entering the instrument at a lower temperature than that of the surrounding air. We are inclined to think that their conclusion is based on a consideration of some only of the heat exchanges which take place in a calorimeter, and that those they have considered are balanced by others which have an opposite effect. For instance, the apparently simple experiment of passing water colder than the surroundings through a calorimeter in which no gas is burning, and concluding that any difference of temperature found between the inlet and outlet thermometers is due to radiation, is not free from objection. The air within the body of the calorimeter, being in contact with a large area of wetted surfaces, will naturally be saturated with aqueous vapour, and will, at the outset, be at about the temperature of the air surrounding the calorimeter. When the cold water begins to circulate through the calorimeter, moisture will be condensed from the saturated air on the outside of the coils through which the water is passing, and the heat due to its condensation will be imparted to the circulating water. Hence the outlet water thermometer should in this trial properly show a slightly higher temperature than the inlet water thermometer, quite independently of exchanges of heat by radiation between the outer wall of the calorimeter and the surrounding air. The condensation of water on the circulation coils will go on so long as the air within the body of the calorimeter is at a higher temperature than the circulating water.

The authors, having concluded, on what we have indicated (as we believe) to be insufficient grounds, that the feeding of a calorimeter with water below the temperature of the surrounding air is liable to cause the heat absorbed by radiation from the air to be credited to the gas which is being tested, proceeded to argue that the feed water of the circulating system of a calorimeter should be at the temperature of the room or at least not at a lower temperature. As a matter of fact, the use of water at the temperature of the room in a gas-calorimeter is liable to introduce a far more serious error than that due to radiation, which the authors claim to have discovered. Moreover, this error is not in favour of the gas. In a calorimeter of the Boys type, for every volume of gas saturated with moisture at the temperature of the wet meter by which it has been measured, there are introduced some eight volumes or more of air [see "JOURNAL" Vol. XCII., p. 809] only partially saturated with moisture at the temperature of the room, which may be the same, but is commonly rather higher, than the temperature of the gas-meter. Let us assume for the moment that there are with a particular instrument eight volumes of air to one volume of gas. The combustion of the gas results in a contraction of these nine volumes of air and gas to about seven-and-a-half volumes of gaseous products of combustion. These seven-and-a-half volumes leave the instrument fully saturated with moisture at the temperature at which they are discharged from it. This temperature is, in most of the more efficient types of calorimeter, about 7° Fahr. above that of the inflowing water. If, therefore, the temperature of the inflowing water is that of the surrounding air, the gaseous products leave the instrument saturated with aqueous vapour at a temperature about 7° above that of the surrounding air; whereas if the temperature of the inflowing water is about 7° below that of the surrounding air, the gaseous products will leave the instrument at the same temperature as that of the surrounding air. Bearing in mind that the air in this country is only partially saturated with moisture—in London on the average about 84 per cent. of saturation—and that, in an occupied room the degree of humidity will be lower

than in the outside air, it will be found that, on the average, the amount of moisture contained in one volume of gas saturated at the temperature of the meter and in the volume of only partially saturated air entering a well-constructed calorimeter will correspond almost exactly with the amount of moisture contained in the reduced volume of gaseous products issuing from the calorimeter, provided the temperature at which the products issue is practically the same as the temperature of the ingoing air. If, on the other hand, the gaseous products leave the calorimeter at a temperature of (say) 7° Fahr. above that of the surrounding air from which the air supply to the calorimeter is taken, they will contain more moisture than the corresponding volumes of air and gas which entered the calorimeter. Heat will have been expended in the evaporation of this additional moisture, which heat will have been derived from the gas consumed, and will not have been imparted, as it should have been, to the circulating water.

Hence, if the circulating water enters the calorimeter, as Messrs. Coste and James propose, at the temperature of the surrounding air, since the products almost inevitably leave the calorimeter in that case at a higher temperature, the gas will be credited with less than its proper calorific value, owing to some of its heat having been expended in evaporating moisture for the saturation of the gaseous products at the higher temperature at which they leave the instrument. This source of error will, we believe, as a rule, be found to more than outweigh any small error in the other direction which may be due to radiation when the water supply to the calorimeter is at a somewhat lower temperature than that of the surrounding air. Provided the circulating water does not enter the calorimeter at a lower temperature than (say) 11° or 12° Fahr. below that of the surrounding air, it seems improbable that there will be any appreciable error due to radiation, and that the attempt to avoid any such error by raising the temperature of the water entering the calorimeter to that of the surrounding air, as Messrs. Coste and James propose, will lead to a still greater error in the other direction being introduced. If it is considered necessary in conditions of an abnormally low temperature of the water supply to guard against radiation errors, it would appear to be simpler merely to slip over the body of the calorimeter a jacket of thick, dry felt than adopt the other and somewhat cumbrous methods suggested by Messrs. Coste and James.

Financial Assistance to Junior Associations.

The Junior Gas Associations have found a new friend in Mr. F. D. Marshall. The enthusiastic reception he received at the Manchester University last Saturday afternoon on the occasion of his lecture—dealt with in an editorial article elsewhere—and the enthusiasm in seeking knowledge that he found to exist among the juniors of the industry in the Manchester district (which we can assure him merely exemplifies what exists in other similar organizations in the country), have, as will be seen from our report, impressed him deeply, and turned his thoughts to the important aspect of the movement—the duty of the seniors in encouraging movement and effort to the utmost of their personal and collective power, in order to help in forwarding and defending the material interests of the industry. Mr. Marshall was not the only one who was impressed on Saturday afternoon. Alderman James Fernley, the Chairman of the Stockport Corporation Gas Committee, was also. It will be remarked that several of the speakers on the occasion urged the importance of the administrators of our gas undertakings taking a living interest in the work in hand for the technical educational advancement of the juniors of the industry who will have to shoulder the full responsibilities of executive office later on. Interest can be both personal and material. The work costs money; and Mr. H. Kendrick pointed out that among the excellent ways in which Gas Committees and Companies could well dispose of a small sum from their coffers would be by helping in the financing of the work of the junior organizations. Alderman Fernley is going to advise his Committee to make a reasonable donation to the funds of the Manchester Junior Institution. We wish him success in his excellent resolve. Actual contact has a great influence in producing knowledge that excites interest and sympathy; and we do exhort other chairmen to go and see for themselves what is being done by these junior associations. They will be heartily welcomed at the meetings by the members. And after contact with the work, we feel sure they will consider it of equal importance to bear in mind the encouragement of the fullest attainment in qualification on the part of their future officers as to adopt new manufacturing plant and processes, and methods conducing to the expansion of the commercial work of the industry.

The Medical Aspect of Workmen's Compensation.

Admitting that the principle of compensation of workmen for accidents that arise out of, or in the course of, their employment is too firmly established to permit of any change except in the way of further extension, and that it cannot long continue in its present developmental stage, a correspondent of "The Times" has been dealing with the medical aspect of the question, which is the key to the whole subject. There are, it is urged, four points which are essential to the proper management of compensation cases from the medical point of view; and these are: (1) Efficient diagnosis at the earliest moment after the accident; (2) treatment, commenced immediately, which must be at all stages adequate and continuous; (3) provision of such accessories of treatment as the workman may not be able to secure, and which hospitals cannot be expected to afford; (4) provision for "permanent" or chronic cases, which must minimize the disaster, save all that is possible of the man's capacity, and tide him over a period of waiting and training for some occupation that will utilize and develop existing or latent powers. These four heads are dealt with fully; and there are many points which can be profitably noted. So far as the employees are concerned, it should be worth while to bear in mind the serious results that may possibly arise from trivial injuries, if not properly attended to. It is a painful, but an accurate, statement that the ignorance or carelessness of the patient and the casual nature of the treatment at hospitals (where it is not, and cannot be, sufficiently insisted upon that attendance must be regular), combined with dirt, drink perhaps, and lowered powers of resistance due to semi-starvation on half-wages, complicate simple wounds with septic and other influences and convert a case that should have healed without complications in a few days into one of many months' duration. This consideration introduces the question of the responsibility for treatment; and on this point there will probably be agreement with the author of the article that if the employer were compelled to provide efficient treatment for injured employees, and they were equally compelled to submit to it, there would be a decided contraction in the sums paid for compensation. No doubt, there would be difficulty to overcome—to some extent, perhaps, on the side of the employers; but such a course would at any rate reduce the possibility of workmen obstructing or neglecting such treatment as would speedily restore them to their old work. That many men have given way to the temptation to make the most of an injury, in consequence of the Compensation Law, cannot be denied; but this temptation would be removed if, as suggested, a man were compelled, as a condition of compensation being continued at full or partial rates, to produce a certificate that he was submitting to regular treatment to the satisfaction of an independent medical man. Then an employer would have, it is argued, the satisfaction of knowing that his liability was limited by the effects of the accident, *plus* the natural and constitutional peculiarities of the patient.

Position of the Tar Industry.

The question of tar is always with the managers of the gas industry. It is impossible to get away from it through the remarkable constancy of the secondary product to low prices. But the points of view of the tar producer and the tar distiller are widely different; the outlook of the latter being generally brighter than that of the former. If it were not for the pressure of very material commercial facts, the paper by Mr. Ernest F. Hooper, on the "Present Position of the Coal Tar Industry," reproduced in other columns, would be encouraging to the gas-supply industry. In a limited measure it is so, in that, notwithstanding the big advance in the business of the gas industry, and the incoming of new and not-to-be-despised contributors to the supply of tar, the commercial position is not worse than it was twenty years ago, although it is not by any means what it should be, considering the value of the tar as a raw material to the distiller. The course of events in gas-works has, it is said, done something to neutralize the danger of excessive over-production. But this effect, we take

it, is comparatively small when compared with the growth of the contribution to supply from other sources during the period that the production of tar in gas-works has not made proportionate increase with the output of gas. With an estimate of 150,000 tons of tar from bye-product recovery ovens and 200,000 tons of blast-furnace tar, being together equal to nearly half the computed available annual production from gas-works—750,000 tons—the gas industry has not reaped extra profit in relation to tar from the course of events to which the author refers. The larger production of gas per ton of coal, and the manufacture of carburetted water gas, are the causes to which reference is made as having done something to reduce the proportion of tar to gas output in gas-works. Mr. Hooper points to the depreciated value of gar-works tar to the distiller during the reign of high-temperature carbonization in horizontal retorts, owing to the free carbon content of the tar. The free carbon figures he now produces require a certain revision by the addition to them of the results of tar produced in heavy charge working in horizontal retorts. High temperatures are employed with vertical retorts; but the carbon content of the tar produced by them is low, compared with the figures shown for horizontal working. With heavy charge working, the latter should surely have a different complexion. The figures (balancing within about £228,000) exhibiting the values of the imports of dyes and dye-stuffs and the exports of coal-tar products in 1909 are interesting, but not satisfactory when we consider what might have been.

Excessive Capitals and Small Returns.

Is it too much to hope that the tales that have been told in our columns so frequently of late regarding the wrecked companies of the Eaton and Preston groups of company promoters will be the means of finally breaking up this miserable business in connection with the gas industry? We like the idea of the bankrupt Preston complaining of some of the misfortunes, in the case of the Bucks and Oxon Gas Company, being due to attacks made on the credit of the Company by outside persons. Preston knew as well as anyone did that the concern was grossly over-capitalized through machinery so carefully provided and run from inception to promotion and after for the purpose of making as large a sum as possible out of the public. Let everyone interested in these matters read the statement of the Official Receiver (as published to-day) at a meeting of the creditors and shareholders, and then say whether the statement pictures Preston and his satellites with clean hands in the matter of their dealings with the public. Compare, too, the valuation of the undertaking of the Company by Mr. Frank H. Jones, amounting to £18,000, and the value of the assets of £45,000 as presented by the Secretary and Directors; and then say whether it is likely the considerable difference is due to any miscalculation on the part of Mr. Jones.

The Innocent Electric Wire.

Day by day our electrical friends open their newspapers in trepidation, and eagerly scan the columns to ascertain whether the wicked pressman has again been arraigning an electric wire or a falling electric lamp for having caused a fire. They feel lucky now if they can pass through a day without meeting the dreaded report, and having to assert the incapability of an electric wire or a falling lamp of being the perpetrator of anything so heinous as causing a conflagration. The public are in these days taking the protests and the denials with an unkind scepticism. There is such a thing as proclaiming too frequently and too loudly one's immaculateness. People are all too prone to think that there is something behind it all; and in this case people who so think do not err. There was the fire at Messrs. Camper and Nicholson's yacht-building works at Gosport towards the close of the old year. It broke out in the oil warehouse of the premises, which was lighted "for safety" by electricity. It was stated that the fusion of an electric wire was the cause. This was promptly denied; but the fact remains (it is so stated in a local paper) that one of the officials of the Electric Light Company, when the alarm was given, for some reason or other, rushed into the building and removed the main fuse. The Acton garage of the London General Omnibus Company was fired last Tuesday morning. The outbreak occurred in the lamp-room; and the daily papers report that it is presumed the fire was caused by the fusion of an electric wire. But there is no assumption about a fire that occurred at Shrewsbury last Thursday at the jewellery establishment of Messrs. Robinson and Co. Beneath the shop, electric wires fused, and actively attacked a gas-pipe in the neighbourhood, and completed the work by igniting the gas. Apparently the order of events is perfectly clear, as by the promptitude of the manager who was sleeping over the shop, the fire was quickly subdued, though the loss is considerable. Had it not been for his promptitude, the fire might have been labelled, as usual, "cause unknown."

Local Government Finance.

The last of the series of Blue-Books comprising the Local Taxation statistics for the year 1907-8, consists of the summary and index, and deals with the transactions of the 25,718 separate authorities who had financial transactions during the year. The preparation of such statistics is a big task; and as every possible precaution is taken to secure accuracy, and the functions of the authorities are so varied, the expenditure of much time in the compilation is unavoidable. Where the accounts of local authorities are not subject to audit by a District Auditor, the labour involved is increased, too, owing to the different methods adopted of keeping the accounts. To complete our notice of the taxation statistics for the year in question, some figures from the Blue-Book now before us (Part VIII.) will be given shortly. Meanwhile, it may be remarked that, as usual, figures are given over a series of years, which fact allows of comparisons being made. In the period which has elapsed between 1899-1900 and 1907-8, the outstanding loans have gone up from £293,864,224 to £503,645,616; but the latter figure includes a sum of £48,123,038 for the Metropolitan Water Board. The amount provided during 1907-8 (otherwise than out of borrowed moneys) for the repayment of loans was £12,994,970, which was equivalent to about a thirty-eighth part of the total amount of loans outstanding at the commencement of the year. The increase in the outstanding loans (£9,158,104) was smaller than any annual increase between the years 1896-7 and 1907-8. Loans to the extent of £21,417,031 were raised in the year, exceeding those in 1906-7 by £1,023,130; but the total was smaller than the corresponding amount in any other year since 1898-9. Of the total outstanding, over 53 per cent. is on account of revenue earning undertakings. Including the Metropolitan Water Board, the average sum per pound of rateable value of loans outstanding increased from £1 13s. 6d. in 1899-1900 to £2 8s. 1d. in 1907-8; and per head of the population, from £9 4s. 4d. to £14 8s. 3d. The average amount per pound of valuation of public rates raised has gone up from 4s. 11·8d. to 6s. 0·3d.; and per head of the population, from £1 5s. 6·6d. to £1 14s. 1·5d. In the same period, the total amount received from rates has risen from £40,734,219 to £59,627,577. In these eight years the amount of outstanding loans on gas-works has gone up from £19,819,301 to £23,358,045; but that for electric light undertakings has grown from £7,853,061 to £28,666,541. In this period, the receipts from gas-works have increased from £6,035,526 to £7,648,814; those from electric light undertakings, from £910,329 to £3,403,887; and those from water-works, from £3,730,219 to £4,768,338. The total receipts have risen from £77,202,175 to £119,424,448. The rateable value of property assessed to local rates was £175,622,758 in 1899; and by 1908, this figure had increased to £212,757,450.

The Late Mr. J. Treleaven, of Launceston.—The funeral took place at Launceston last Wednesday of Mr. James Treleaven, who had for many years been closely identified with the public affairs of the town. With one short interval, he was a member of the Town Council from 1873 till his death, which occurred on the 31st ult., at the age of 77. On three occasions he was elected Mayor; and he was also a Justice of the Peace. Not the least of his services were associated with the gas and water undertakings. In 1874, he and two or three other inhabitants joined in the purchase of the gas-works, which up to that time had been owned by Messrs. Henderson and Browning, of Plymouth. On completing the purchase, the little local Syndicate offered the undertaking to the town at the price they had paid for it; but a public meeting which was called to consider the matter decided against the purchase, and a Company was formed to carry on the business—Mr. Treleaven being appointed Managing-Director. He qualified for the position by making a study of gas manufacture. For the long period of 31 years, he watched over the affairs of the Company, which owed a great deal of its success to his labours. A few years ago, he retired from his position, leaving the works in a high state of efficiency, with the price of gas at 3s. 6d. per 1000 cubic feet, compared with 6s. when he and his friends took over the concern. As a member of the Town Council, Mr. Treleaven also showed great interest in the water supply of the borough.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 112.)

THE Stock Exchange reopened for the New Year on Tuesday; but the holiday feeling was not quite discarded, and business was decidedly quiet. The tone in the leading departments, however, was quite good, and there seemed to be a general resolution that markets shall be made to improve. This was conducive to cheerfulness. But as the week progressed, it encountered the stubborn fact of a sharp demand for gold for abroad; and as the Money Market tightened, it made prices more difficult to sustain, though no great harm was done them. On Tuesday, Home Government issues were well supported, and Consols rose $\frac{1}{8}$ for money and $\frac{3}{8}$ for the account. Rails did not alter much; and the Foreign Market was strong. Business got fuller into swing on Wednesday, and the tone was very encouraging—a wide-reaching array of issues being advanced in price. Gilt-edged things were the more conspicuous, especially Government issues and Railway secured stocks. Choice descriptions were still in fair demand on Thursday, though business was quieter, and there was some realizing in view of harder money. Consols lost $\frac{1}{8}$. On Friday, the brightness faded a little, and business dwindled away—prices showing shrinkage. Consols fell $\frac{1}{4}$ for money and $\frac{1}{8}$ for the account, and Railway ordinaries were dullish; but Americans developed strength. Saturday was very quiet and mostly unchanged. Consols were unaltered, and Railways steady. The Money Market opened with an abundant supply after the close of the old year; but the demand soon increased, and rates hardened materially. Business in the Gas Market was more active, with an excellent tendency all round; all variations being in the upward direction. The last half of 1910 will probably show satisfactory working, though sales of gas must have been affected by the remarkably mild December. In Gaslight and Coke issues, the ordinary was brisk and strong, with transactions ranging from 105¾ to 106¾—a rise of ½. In the secured issues, the maximum realized 86½, the preference 103½ and 104½, and the debenture 78½ to 80. South Metropolitan was quite active and firm at from 121½ to 122½. The debenture marked 82. In Commercials, the 4 per cent. was dealt in at 108 (a rise of 1), the 3½ per cent. at 101½ and 101¾, and the debenture at 78. Among the Suburban and Provincial group, Bournemouth "B" changed hands at 16⅜, Brentford new at 196 and 196¼ (a rise of 2), ditto preference at 120½ and 121, South Suburban at 120½ and 121½, Tottenham "A" at 141¾, and ditto "B" at from 113¾ to 114½. On local Exchanges, Liverpool "A" marked 221, and South Shields 156. In the Continental companies, Imperial was done at from 185 to 186, ditto debenture at 95½, Union at 86⅛ and 89, European fully-paid at from 24 1/16 to 24¼, and ditto part-paid at 18. Among the undertakings of the remoter world, Buenos Ayres made 96½, Cape Town preference 4 7/16 and 4 15/16, Primitiva 7 5/16 to 7½, ditto preference 5¼ to 5⅜, and San Paulo 15½.

ELECTRICITY SUPPLY MEMORANDA.

Attempts to Discount Gas Successes—Electric Arcs v. High-Pressure Lamps—How the Fire Occurred on the Midland Express—Necessity for Illumination—Meanness of Light Provision in Electrical Competition—Idle Words from Electrical Sources.

THE electric supply companies of London are very anxious to do something, even at a loss or by free lighting, that will serve as a little covering for the chain of successes of the inverted gas-burner in enabling the Gas Companies to book large contracts over a term of years for public lighting. There was the Piccadilly Circus offer, in which a distracted and humiliated Electricity Supply Company prayed to be allowed, by the Westminster City Council, to put up a dozen large flame arc lamps on three standards, supplying and maintaining them *free* for five years, in order to lower the crest of the Gaslight Company by pouring over their lamps an amount of illumination considerably in excess of the Gas Company's contract quantity, and that excess illumination of an altogether different colour. At first a Committee of the City Council were favourable; but the very nature of the offer, it was afterwards seen, was not so much in the public interests as in that of the Electricity Company. It was palpable that it was a form of philanthropy in which self-interest predominated. Then there is that so-called comparative trial that is still proceeding in Gower Street, where the competing Electricity Supply Company have displayed a pretty little piece of finesse by putting up more lamps than the Gaslight Company, and these electric lamps of higher candle power, with the view of showing the "superiority" of electric lighting. This was a matter dealt with last week (p. 15). We turn from Holborn to Paddington. Twice have Committees of the Borough Council recommended the adoption of the Gas Company's contract—the second time after considering tenders of the Metropolitan Electric Supply Company. Decision in the matter has been further postponed, on the tearful petition of the latter, who are very desirous of having an interview with the Committee having the matter in hand to show them how, by partly lighting the borough by electricity and partly by gas, £1000 a year can be saved to the ratepayers. The scheming by the electrical competitors now that they are awake to the fact that the gas industry is neither dead nor sleeping, is wonderful to behold. They are out to save something in public lighting; and, at any cost, save it they must. But all this see-sawing, all this electrical strategy, in connection with these public tenders and contracts for lighting is not fair to the Gas Company concerned. We know of no other form of public work in which such procedure would be countenanced. Consider this, too, in conjunction with the tenders of gas companies for public lighting in places where there is municipal ownership of the electricity supply. In some instances, the electricity committees are the public lighting committees. They consider the gas tenders; and then, with the knowledge before them, they submit tenders to themselves for lighting the streets by electricity. This is local government in the new style; and the style is altogether contemptible and unjust.

There has been interest in reading an article, by Herr F. Göhrum, the Chief Gas Engineer of the Municipal Gas-Works at Stuttgart, that has appeared in "The Illuminating Engineer." It is entitled "Some Æsthetic Aspects of Street Lighting." But the article seems to us to lean more to the utilitarian than to the æsthetic aspects of public lighting; and that is the side of consideration that should rise above all else. Herr Göhrum points out that for a time the electric arc lamp was the only acceptable illuminant to meet the required conditions for illuminating wide streets. Then came the powerful high-pressure gas-lights; and in mentioning these, he says: "Just as the increased cost of street lighting by more powerful units proved no obstacle to the introduction of the electric arc lamp, so to-day the question of cost will be found to play a relatively small rôle in the case of streets in which the prime object is to produce an impression of great comfort and brilliancy." That may be quite true in the case of our Teutonic friends; but it is equally true that it is an idiosyncrasy of the majority of our British municipal bodies that, while they are willing to spend on electric arc lighting many hundreds of pounds per mile of street, they will begin to talk of the need for economy, and wear very worried looks at a suggestion to spend a few pounds more per mile on gas lighting improvement. Perhaps this is due to the progress of the gas industry, and the improvements in gas-burners, having been, as a rule, accompanied by reduced costs; and the local authorities cannot reconcile themselves to any departure from this order of things in association with gas. But electricity they do associate with extra expense. To proceed with the article. The question is raised which of the two illuminants, gas or electricity, offers the nearest approach to the ideal method of street lighting; the ideal being the system that conforms the nearest to diffused daylight. One would naturally select the illuminant the spectrum of which has the closest approximation to diffused daylight. The conclusion arrived at is that high-pressure gas-light can be made to yield an exact resemblance to daylight, and that a slightly warmer tint can be added by suitably modifying the proportions of cerium and thorium in the mantle. On the ground of colour, therefore, the incandescent gas-light should be regarded as preferable to the electric light. A characteristic of diffused daylight is uniformity; and uniform illumination depends largely on light distribution. In the electric arc lamp, the maximum candle power is located at angles from 15° to 55°—on the average, about 35° to the vertical. With the incandescent gas lamp the maximum occurs near 45° to 100°—on the average 75° to the vertical. The result of this is that it is easier to secure approximate uniformity of illumination in the latter case. The steadiness of the illumination of the incandescent gas-lamp is another good feature; the electric arc lamp in this respect not being so satisfactory. It is well known that with electric arcs considerable fluctuations do occur, which in the case of flame arcs may reach 20 per cent. or more, and give rise to unpleasant effects. There is one point with which the writer of the article does not deal, and that is the wholesale extinctions of electric lamps that take place, sometimes through the most trifling cause, and suddenly plunge whole streets, places of public assembly, and railway stations in darkness. There is also the subject of the relative penetrating power in fogs and mists. But he shows that there are considerations apart from cost to be taken into account in looking into the matter of the relative suitability of gas or electricity for public lighting.

The "Electrical Review" was able to finish up its editorial work for last year with a typically worded article on the Midland Railway disaster. We will not repeat the expressions, as there is no desire on our part to accentuate the horror of the occurrence. But the extent of the knowledge of our contemporary on the subject is another matter, and is well exemplified by the following extract: "In this instance, so far as we can gather from the various reports in the Daily Press, only the restaurant car carried gas-tanks. These exploded, or were burst open by the collision; and the resulting fire was propagated from coach to coach. . . . But there is no need to carry gas even for cooking. This can be done with electricity just as easily as the lighting is done, and with far greater convenience and comfort than cooking by gas." The first amusing part of this statement is that there was no dining-car on the train. The second is that the writer of the quoted passages evidently knows more about the matter than those who were on the spot. His omniscience ought to be very useful at the Board of Trade inquiry, because for the first time we have it categorically asserted that the fire resulted from the "explosion" or breaking open of the "gas-tanks." As was shown in an editorial article in our columns last week, such an assertion is more than the evidence warrants. It is a pitiful thing to see the pursuit of a cause resulting in such exhibitions of fulmination as have been seen on this subject from time to time in our contemporary—leading it surely and progressively into greater foolishness. We wonder whether Clapham

and Accrington ever disturb the rest of the Editors of that paper. There is the point, too, about the cooking on a train being as easily accomplished with electricity as with gas. The "Electrician" refutes the "Review." It says that provision must be made for cooking; and the heat for this—at least on the usual systems—cannot be supplied from the electric light circuits. The "Electrician" turns to the more practical view as to constructing railway coaches entirely of steel.

"Meteor" of the "Electrical Times" has been indulging his ignorance of gas matters again. The subject under treatment was the lighting of the Hastings Workhouse, which is as transparent a piece of municipal intrigue in influencing what should be an independent public body as we have ever come across. "Meteor" seems to be labouring under the delusion that the present units of gas lighting are confined to 50-candle power. The electrical idea of the universal gas unit was at one time 64 candles. Incandescent gas-burners can be obtained of 17, 20, 25, and so on, right away up to 4500 candle power, if desired; and the tap is always available for reducing or increasing gas consumption and light. Thus there is no reason why, if the Hastings Guardians have a liking for a variety of units about the establishment under their charge, they should not have them. It is suggested by our volatile electrical friend that, so as to swell the total candle power for the money, the Gas Company would put 50-candle power lamps into closets and back passages. The bulk of the electric lamps that the Borough Electrical Engineer thinks sufficient for the purpose of lighting the establishment are of 17-candle power; and there are 323 of these out of 486. We were not aware that the closets and back passages in the Hastings Workhouse predominated over the other quarters, and therefore required so many small unit lamps. To the remainder of the establishment, there are 163 lamps allocated by the Borough Electrical Engineer; and "Meteor" loosely asserts that "plenty" of these are of 100 and 50 candle power. All told, we can only count 24—twelve of each sort, 81 others being of 32-candle power and 58 more of 25-candle power! So that it is seen that liberality is not a trait of the Borough Electrical Engineer when dealing with the lighting of a workhouse, and when competing against gas lighting. Not only has he sadly trimmed-down his units to the meanest possible point for the old people who have to find asylum in the place, but he has reduced the points of gas lighting by 124—from 610 to 486. And "Meteor" assertively says that the workhouse "will have a better and cheaper service" by adopting electric lighting. Easily written, friend "Meteor," but not so easily proved, especially with electricity at 4¼d. per unit, which is a fearfully extravagant price compared with the generating costs by a private plant. On this point, "Meteor" tries to impose upon the municipally nursed electrical credulity of a majority of the members of the Hastings Board of Guardians by hinting at all sorts of extras. The price submitted by Mr. Charles F. Botley was an inclusive sum for the amount of current allowed in the electrical estimate. What, therefore, becomes of "Meteor's" suggestion on the point of extras? Has he heard of the Gas Company's success over the Corporation in the matter of gas-generated electricity for St. Leonards Pier, when the price asked per unit by the Corporation was less than they are now requesting ratepayers to pay per unit for the lighting of the workhouse? If not, "Meteor" might improve his knowledge of Hastings affairs by looking up the history of this most interesting incident. But he had better not mention it to the Borough Electrical Engineer.

Ora pro nobis. It is a matter for regret that we should have to call attention to anything that is likely to cause depression in the minds of our readers so early in the New Year. But it is a duty to chronicle the trend of electrical opinion and events; and there are a few extracts to be made from the reflections of our electrical contemporaries upon the year 1910.

From the "Electrical Review:"

> The matter of supreme interest in 1910 has undoubtedly been the great progress that has been made toward the supersession of the carbon-filament lamp, the street gas-lamp, and the domestic gas mantle, by the metallic-filament type of lamp. We have not been able to make the latter at such a rate as to keep pace with the requirements—far from it.
>
> We have observed with great satisfaction during the past year the enterprising efforts of electricity works' authorities in a number of places to prove beyond a shadow of doubt that nowadays the old, and once sceptically regarded, cry of electricity being the "poor man's light" is absolutely true. If we could only simplify the problem that is presented by the gas-cooking stove, which came so opportunely to the help of the gas companies, so that electricity could be economically employed in the average household for all purposes, electricity would advance by bigger leaps and bounds than ever before.

From the "Electrician:"

> The application of electricity to heating and cooking has now reached a stage when it already has a past, and may look forward to a successful future. . . . At the present time the apparatus does not appear to be designed with an eye to how it will be afterwards employed; while on the other hand supply engineers are not doing sufficient with the equipment at their command. In spite of this state of things, electric heating and cooking have made substantial progress.
>
> Electric lighting has made a satisfactory advance during the past twelve months, notwithstanding the unfair competitive methods employed by our gas rivals. In some cases these methods have undoubtedly met with temporary success.

We will try to bear both the optimism and the accusation without comment, excepting to say on the subject of unfair competitive methods that our thoughts persist in wandering to sundry places where there is municipal ownership of electricity undertakings.

OBITUARY.

SIR JOHN AIRD.

We regret to announce the death last Friday, at his residence, Wilton Park, Beaconsfield, of Sir John Aird, Bart. As most of our readers are aware, Sir John had been ill for a long time; and recent references in the daily papers to his serious condition prepared his many friends for the sad news which reached them on Saturday morning. By his death there has been removed from the engineering world one of the greatest contractors of his time.

Sir John Aird was born in London, on Dec. 3, 1833; his father being Mr. John Aird, the son of a Ross-shire artisan, who came to London about a century ago to take up employment on the Regent's Canal, then in course of construction. Left an orphan at the early age of ten, his first experience was gained in the service of the Phœnix Gas Company. Possessing considerable ability and energy, in course of time he became a contractor in a small way of business. The turning-point in his career was when the Municipality of Berlin advertised for tenders for the construction of water-works, and he was fortunate enough to obtain the contract. He subsequently undertook some of the work connected with the London drainage scheme; and in 1851 he was responsible for the erection of the Great Exhibition building in Hyde Park, and, later, its re-erection at Sydenham. His son John, who was born while his father was with the Phœnix Gas Company, was only eighteen when the first of these undertakings was in progress. He had gone into his father's business on leaving school, and, as his assistant, was associated with the carrying out of a number of gas and water works in this country and abroad. Besides the Berlin works, the firm constructed the water reservoirs at Hampton and Staines, the first water-works at Amsterdam, and others at Copenhagen, Cagliari, and Altona. In conjunction with Messrs. Brassey and Wythes, Sir John took an important part in the construction of those at Calcutta and Simla. The gas undertakings with which he was associated included the Beckton works of the Gaslight and Coke Company, and others at Copenhagen, Moscow, Bahia, and Pará. He was also associated with Lucas Brothers in the joint firm of Lucas and Aird, who, and their successors, Messrs. John Aird and Sons, carried out many extensive works, including a portion of the vast scheme for the supply of water to Birmingham. But probably their most conspicuous undertaking was the great Assuan dam on the Nile.

Sir John Aird was returned as a Member of Parliament in the Conservative interest for North Paddington in 1887, and held the seat until 1905. In the House of Commons, he was, among private members, a conspicuous and popular personality. He was elected first Mayor of Paddington in 1900, and was re-elected in the following year. He was Major and honorary iLeutenant-Colonel of the Engineer and Railway Staff Corps. He was elected an associate of the Institution of Civil Engineers on Dec. 6, 1859, and a member of the Iron and Steel Institute in 1887. In 1886, he served on the Royal Commission on the Depression of Trade. He was created a baronet by Lord Salisbury in 1901.

Sir John was at one time well known as a patron of modern artists; but his collection was chiefly formed about a quarter-of-a-century ago. His portrait, by Sir Luke Fildes, was in the Royal Academy in 1898; Lady Aird's portrait was painted by Mr. Frank Dicksee; and Mr. P. H. Calderon painted that of his eldest daughter, Mrs. Basil P. Ellis, whose late husband was, as readers of the "Journal" will recollect, a member of Sir John's firm.

The deceased baronet was from 1887 to 1902 a Director of the Gaslight and Coke Company; and he was also Chairman of the Cagliari Gas and Water Company, Limited, whose undertakings were transferred to the Municipality about two years ago. He was a prominent Freemason, and was one of the founders and a Past-Master of the Evening Star Lodge.

At the age of twenty-two, Sir John married Sarah, daughter of Mr. Benjamin Smith, of Lewisham, by whom he had a family of two sons and seven daughters. Lady Aird died in April, 1909. The successor to the title is his elder son John, who was born in 1861, and married, in 1886, Alicia Ellen, daughter of the late Mr. James Hall Renton. They have a family of two sons—of whom the elder (John Renton, born in 1898) now becomes heir to the baronetcy—and two daughters.

The "Daily Telegraph" for last Saturday contained a portrait of Sir John Aird, and a personal sketch by "One Who Knew Him." In the course of the latter, the writer said: "Sir John Aird was a man who thoroughly justified the hackneyed phrase 'a striking personality.' To see him once was to remember him ever afterwards. His figure impressed one with an indelible memory. . . . In business life, he was a typical Scotsman, although London claimed him as a native. Keen and perhaps a little brusque in manner, business was to him the one thing that claimed his attention when business had to be attended to. Like the great majority of business men, he believed that the morning was the best part of the day for work; and the amount of work which he

contrived to get through before noon was enormous. Surrounded as he was by a staff of helpers who were devoted to him, and who studied him in every way, everything was, of course, done to save him from unnecessary worry; but one who has worked with him in the most intimate manner for many years tritely expressed it when he said: 'Sir John was a demon for detail.' With him it was really the little things that counted; and thereby he became a great engineer. Sir John Aird belonged to that type of politician who has almost seen his day. His political ideas were formed and unalterable; and he was such a man as delighted the Chief Whip's heart. It was just the same with him in municipal matters. As first Mayor of Paddington, he showed over and over again that he was not a man who could 'suffer fools gladly.' . . . To sum him up, he was a strong, rugged man, gifted with a clear brain, a responsive heart, and tremendous energy; and his weaknesses were only those which are invariably associated with overpowering strength of character. How few men have left behind them so noble a monument!"

Mr. WILLIAM MACKEAN, for many years with the Welsbach Incandescent Gaslight Company, died on the 31st ult, at his residence at Balham, aged 43.

The death occurred on New Year's Day, as the result of an apoplectic seizure, of Mr. FRANK DETHRIDGE, who for forty years held the offices of Vestry Clerk and Town Clerk of Paddington. He relinquished the latter position about eight years ago, and went to reside at Brighton. His name was at one time frequently mentioned in our columns, as he was instrumental in getting the average-meter system of public lighting introduced into Paddington. He also assisted Mr. Archibald Dobbs in his long litigation with the Grand Junction Water-Works Company. Deceased, who was in his 75th year, leaves a widow and one daughter.

PERSONAL.

Professor HAROLD B. DIXON, of the Manchester University, has been appointed Gas Examiner to the Eccles Corporation for the ensuing year, pursuant to the Salford Corporation Act, 1897.

Mr. FRANK P. MARSHALL, son of Mr. F. D. Marshall, after serving his pupilship with the Gaslight and Coke Company, has been appointed Assistant-Engineer to the Beckton works. Mr. Marshall was educated at Charterhouse and King's College.

The marriage was celebrated, at St. Paul's Church, South Hampstead, on Dec. 31, of Mr. BERNARD BROWNE, son of Mr. and Mrs. A. F. Browne (formerly Engineer of the Buenos Ayres Gas Company), and Miss WINIFRED FAGGE, daughter of Mr. and Mrs. Arthur Fagge, of Hampstead.

As already announced in the "JOURNAL," Alderman COTTON, the Chairman of the Alliance and Dublin Consumers' Gas Company, has been chosen as the representative of South Dublin in the new Parliament. He has consequently declined nomination as Lord Mayor of the city this year, as he considers Irish members should give constant attention to their parliamentary duties in the coming session.

At the Grand Hotel, Birmingham, a few days ago, Mr. T. E. UPJOHN, of the English branch of Messrs. Stewarts and Lloyds, Limited, was presented by his colleagues with a handsome gold watch and chain, suitably inscribed, in commemoration of his completion of 35 years' service with the firm. The presentation, which took place at a complimentary dinner, was made by Mr. J. F. Atkins. In acknowledging the gift, Mr. Upjohn contrasted the position of the firm when he joined it and now. The pleasant incident was the outcome of a spontaneous and unanimous desire on the part of the staff to testify their affectionate regard for Mr. Upjohn, and their appreciation of his services.

Reports of Gas Associations for 1910.—As announced in the "JOURNAL" last week, this work is now ready. The volume contains the collected reports, as given in our columns, of the proceedings at the meetings of the various District Gas Associations held in the past year. The technical matter occupies 510 pages, and it is illustrated by fourteen diagrams, &c., and a folding plate. Reference to any subject is facilitated by an index; and at the end of the book are given lists of the officers and members of the Associations. The volume, which is the twenty-eighth of the series, forms a useful companion to the "Transactions" of the Institution of Gas Engineers.

Manchester Technical School Journal.—We have received from the Manchester Municipal School of Technology Vol. III. of the "Journal" of the School, containing a record of investigations undertaken by members of the teaching staff and students during the year 1909. Thirty subjects of great variety were investigated, and the results, with a few notices and abstracts, occupy nearly 400 large pages. The only subject bearing upon questions in which our readers are specially interested is that of "Mechanical Ventilation," which is dealt with by Mr. J. Radcliffe; his article being based on a paper read at the summer meeting in Manchester of the Institution of Heating and Ventilating Engineers. The book was printed in the Photography and Printing Crafts Department of the School; and it is a very creditable production. It is published by the Education Committee.

GAS BILLS FOR 1911.

[Second Article.]

IN this second instalment of the review of the gas legislation projected for the coming session, the Bills of existing statutory companies seeking additional powers are dealt with.

The first, in alphabetical order, is that of the Chichester Gas Company. It is desired, *inter alia*, to extend the Company's limits of supply, and to receive authority to issue additional capital. From the preamble, the information is gathered that the capital sanctioned by the Company's Act of 1868 has been issued, and is represented by the sum of £18,000 of "A" capital stock, entitled to a maximum dividend of 10 per cent. per annum. The capital of £10,000 authorized by the Order of 1881 has been raised by the issue of shares to the nominal amount of £6080, represented by "B" capital stock—the premiums on this issue amounting to £3920. Of the capital of £25,000 authorized by the Order of 1906, there has been issued capital of the nominal amount of £13,000 ("C" stock), the premiums on which amounted to £3085, leaving £8915, inclusive of premiums, to be raised. A sum of £9030 has also been raised by the issue of debenture stock. The Company ask for their limits of supply to be extended by the inclusion of Bosham, Chidham, Funtington, Boxgrove, Donnington, Lavant, Merston, and West Stoke, and specified portions of the parishes of Hunston and North Mundham. By the Petersfield and Selsey Gas Act of 1901, the parishes of Donnington, Hunston, and North Mundham were included in the area of that Company; but they have not exercised their powers therein. The present promoters, therefore, submit the expediency of determining the powers of the Petersfield Company. In the extended area, the Company ask for the right to charge a price not exceeding by more than 6d. per 1000 cubic feet the charge within the limits defined by the Act of 1868. The Company desire power to raise additional capital to the extent of £20,000 by the creation of "C" stock or preference shares or stock. The new clause referring to issues of capital by auction or tender will apply to the additional capital. It is proposed that, on the part of the capital issued as preference, the dividend shall not exceed 6 per cent. The right to one-third borrowing powers in respect of the issues of the new capital is asked for. In the testing of their gas, the Company seek the use of the "Metropolitan" No. 2 burner, in accordance with current practice. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

The preamble to the Bill of the Enfield Gas Company shows that the amount of issued consolidated ordinary capital on which dividend is payable is £127,280 (on which premiums have been received amounting to £11,057), and that the consolidated preference stock issued is £26,325. The total of the sums borrowed is £30,500, the interest on which (except £5500 at 5 per cent.) is 4 per cent. Turning to the clauses of the Bill, the Company desire the right, for the purpose of extending the gas-works, to purchase or take on lease (by agreement) certain lands fully described in a schedule; and they also ask for confirmation of the purchase by them of so much of the lands as has already been acquired. The scheduled lands are to be devoted to manufacturing purposes. Power is desired to the raising of additional capital not exceeding in the whole £100,000, subject in its issue to the provisions of the present form of auction and tender clause. But before offering any issue to auction or tender, the Company ask to be allowed to give consumers of gas and employees an opportunity of purchasing it. Regarding borrowing powers, the Company wish for (together with the sums authorized to be borrowed under previous Acts) the usual one-third equivalent of the issued capital. There is a clause asking for the right to (by agreement) redeem or substitute the portion of the debenture stock at present receiving 5 per cent. interest. It is proposed to repeal the insurance fund powers conferred by the Act of 1898, and obtain sanction to the creation of a special purposes fund. There is also a request for authorization to the formation of a capital redemption fund by half-yearly appropriations out of revenue of a sum not exceeding £500. The power, it is proposed, shall cease to operate as soon as the Company have appropriated and applied sums amounting in the aggregate to £40,000. It is provided that no person, other than a person who at the date of the passing of the present measure is an auditor of the Company, shall be appointed as an auditor who is not a chartered accountant. The Company (like several other promoters again this session) ask for authority to determine the remuneration of the Secretary. In the prepayment meter clause, the excess of 10d. without cooker and of 1s. with cooker is varied in the following form:

> The Company shall not charge for the hire of any prepayment meter and fittings to be used herewith any sum other than a sum of money calculated according to the quantity of gas supplied through such prepayment meter, and the maximum sum to be so charged shall be at a rate of 11d. per 1000 cubic feet supplied in manner aforesaid; such sum to include the hire of meter and the fittings used therewith and cooking-stove.

There is included in the Bill the old 10 and 15 per cent. discounts clause, though the parliamentary authorities have removed the necessity for this by an extension of section 13 of the Act of 1847, which extension is provided for in the measure. A stand-by clause (on the Mountain Ash lines, but applying to both gas and electricity) is included. A further useful clause is the following:

> The Company shall not be liable for any damages caused to any

consumer by reason of the non-repair of any gas-meters, prepayment meters, fittings, gas-stoves, cooking, or other apparatus, let by the Company on hire unless notice in writing of the want of repair of any such meters, fittings, stoves, cooking, or other apparatus shall have been given to the Company, and they shall have neglected to repair the same within a reasonable period after the receipt of such notice.

Clauses are inserted to authorize the Company to supply power gas, on conditions that have precedent in Acts of past sessions. Subject to scheduled regulations, the Company are seeking power to employees to dispose by nomination of any stock or money left, under the co-partnership rules of the Company, at death. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Bill of the Gaslight and Coke Company is beyond question the chief gas measure of the session, dealing as it does with the scheme for further pushing out the borders of the area of supply by the absorption of the Barking and the Chigwell, Loughton, and Woodford Gas Companies. Once more we are reminded by the preamble that the Gaslight and Coke Company was originally incorporated by Royal Charter in 1812. Passing over the very condensed parliamentary history of the Company, we learn that the issued capital of the Barking Company now consists of £36,000 in fully-paid 6 per cent. preference shares of £10 each, £20,000 in fully-paid original shares of £10 each, entitled to a maximum dividend of 10 per cent. per annum, and £48,000 in fully-paid ordinary shares of £10 each, entitled to a maximum dividend of 7 per cent. per annum. There are no arrears of dividend on the 7 per cent. maximum ordinary shares of the Barking Company. The Company have, however, for some time past been making periodical payments out of their profits to the holders of the 10 per cent. maximum original shares on account of arrears of dividend; but there is still outstanding in respect of them £9 2s. 10d. on each share. The Barking Company have created and issued 4 per cent. perpetual debenture stock to the nominal amount of £36,260. The issued capital of the Chigwell Company consists of £108,500 consolidated ordinary stock, entitled to a standard dividend of 5 per cent. per annnm, subject to increase or decrease in accordance with the decrease or increase below or above their standard price of 4s. 6d. per 1000 cubic feet in the price for the time being charged for gas. This Company have also created and issued 4 per cent. debenture stock to the nominal amount of £17,100. The areas within which the Barking and Chigwell Companies are respectively supplying gas adjoin the area within which the Gaslight Company are supplying gas; and the two Companies have agreed to sell their respective undertakings to the Gaslight Company on terms set forth later in the Bill. The price now charged by the Barking Company for gas is 2s. 11d. per 1000 cubic feet; and the price charged by the Chigwell Company is 3s. 4d. per 1000 cubic feet. The price at present charged by the Gaslight Company for gas in their existing area of supply is 2s. 8d. In reference to the proposed conversion of preference stock into ordinary stock, it is seen from the preamble that this is really a very small matter. By section 13 of the Gaslight Company's (Capital Consolidation) Act, 1898, the right was conferred upon the holders for the time being of the "A" 5 per cent. preference stocks (first, second, and third issues) of exchanging or converting the stock into ordinary stock in certain proportions. But the amount of such preference stocks which has not been so exchanged is now only £130; and it is therefore expedient that the Company should now be empowered to cancel this remnant of preference stock, subject to certain specified terms and conditions. Turning now to the clauses, it is seen that it is proposed that the transfer of the two undertakings shall take place on Jan. 1, 1912. The terms of transfer are that to each holder of the 10 per cent. maximum original shares of the Barking Gas Company, the Gaslight Company are to hand, for every ten shares held, £215 of their ordinary stock, together with £30 in cash by way of composition for arrears of dividend on each ten shares; and to each holder of 7 per cent. maximum ordinary shares, for every ten shares held, £150 of ordinary stock. And so in proportion. Each holder of 6 per cent. preference shares of the Barking Company will receive, for every ten shares held, £200 of 3 per cent. debenture stock in the Gaslight Company. Each holder of 4 per cent. perpetual debenture stock of the Barking Company, for each £100, will receive £133 6s. 8d. of 3 per cent. debenture stock of the Gaslight Company. The terms in the case of the Chigwell Company are: Each holder of consolidated ordinary stock will receive, for each £100, £155 7s. of ordinary stock of the Gaslight Company; and each holder of 4 per cent. debenture stock of the Chigwell Company will receive £133 6s. 8d. of 3 per cent. debenture stock of the Gaslight Company for each £100 of present holding. Power is asked to the creation of the necessary nominal amounts of ordinary and debenture Gaslight stocks. Provision is made for dealing with fractional parts of £5 of shares or stock, by cancelling through a cash payment or by sale to a willing purchaser of the necessary stock to complete an amount of £5. Several heavy subsidiary clauses follow; among them being one providing for the payment by the Gaslight and Coke Company of the dividend for the half year ending December next. Provision is also to be made for the extinction of the unexercised capital and borrowing powers of the Barking and Chigwell Companies. A clause is inserted providing for the testing of the gas in the two districts being made by the apparatus prescribed for the Metropolis by the Gas Referees. It is also asked that not more than one controlling authority shall be entitled to recover a forfeiture in respect of defective illuminating power, excess of impurity, or insufficiency of pressure on any one day in the two areas. It is also proposed that the controlling authority shall give the Gaslight Company six hours' notice in writing of their intention to make a test; and they are to state the day on, and the hour at, which the test is to be made. The compensation to the Chairmen and Directors of the two Companies for loss of office is to be the equivalent of seven years' purchase of the amounts which on Nov. 17 last were the amounts divisible annually among them. Each of the Auditors of the Companies is to be paid a sum equal to three years' remuneration of his office. Arrangements are made for the compensation of officers not taken over, or who may not be willing to enter the service of the Gaslight Company, with ten years or upwards of continuous service to their credit, on agreed terms or terms to be determined by arbitration. Other clauses deal with the obligations resting on the two Companies and on the Gaslight and Coke Company respectively. The reserve funds of the Companies are to be transferred, and form part of the reserve fund of the Gaslight Company. The meter and stoves renewal fund of the Barking Company and the renewal fund of the Chigwell Company are to be transferred, and be similarly applied by the Gaslight Company. As to the prices to be charged for gas in the two districts, between the taking of the meter indices in the Barking district for the Christmas quarter of 1911 and the taking of the indices for the Christmas quarter of 1913, the price is to be 2s. 9d. per 1000 cubic feet, or the price charged by the Gaslight Company north of the Thames, whichever is the higher. After the Christmas quarter of 1913, the price will become uniform with the charge in the other part of the Gaslight Company's area. In the Chigwell district, the price is to be 3s. for two years, for the next two years 2s. 10d., and afterwards uniform with the other parts of the area. Until Christmas, 1913, the price of gas for public lighting is to be 2s. 6d. per 1000 cubic feet; and thereafter the conditions as to price for public lighting ruling elsewhere in the district will apply. Then follow the clauses as to the cancelling or conversion of a small amount of preference stock to which reference has already been made. Among miscellaneous clauses is one to create a special purposes fund, and another to empower the Directors to determine the salary of the Secretary. From the passing of the Act, too, the amount payable each year as the remuneration of the Auditors is to be a sum not exceeding £600 as the Directors may from time to time determine. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The succeeding Bills are lighter for the reviewer. The measure of the Luton Gas Company falls for notice. The history of capital issues forms the major part of the preamble. It is passed over until the paragraph is reached in which it is stated that since 1858 the Company have expended out of revenue on capital account certain sums amounting in the whole to £90,571 odd; and it is considered expedient that provision should be made for the money so expended forming part of the capital of the Company not entitled to dividend. Power is sought to take further land for manufacture and storage purposes. The Company also desire to be empowered to raise additional capital not exceeding in the whole £100,000, to which the new clause governing sales by auction and tender is to apply. The dividend on this additional capital is not to exceed 5 per cent.; and the sliding-scale clause of the Company's Act of 1890 is in relation thereto to read and have effect as though 2s. 6d. were inserted therein, instead of 5s. The proposed representation in the capital account of money expended out of revenue for capital purposes is to have the designation "E" attached; and, as said previously, it is not to be considered as part of the capital entitled to dividend. The Company ask for sanction to borrow under the Acts of 1858 and 1890, and this measure, any sum not exceeding (inclusive of £12,200 already borrowed), £51,853. The issues of the additional capital, it is also intended, shall carry the right to one-third borrowing powers. Permission is asked to the creation of a special purposes fund. It is proposed to enact that the balance of divisible profits shall not at any time exceed the amount required to pay one year's dividend at the authorized rate, or the sum of £12,000, whichever is the greater amount. It is proposed that the standard illuminating power of the gas shall be reduced from 16 to 14 candles, tested by the "Metropolitan" No. 2 burner. A stand-by clause, after the Mountain Ash form, appears. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Swansea Gas Company have exhausted their capital powers, and have only a small balance of borrowing power. They therefore require further money authorization, and take the opportunity of securing several other powers. Lands are scheduled for further purchase, and works construction and maintenance sanction is included. The additional capital sought is £200,000, to be issued under the modern conditions. As to borrowing powers, the Company ask for the right to borrow an additional sum not exceeding £22,500 in respect of the capital sanctioned by existing Acts and Orders, and in respect of the present additional capital up to one-third part of the issues. The portion of the additional capital issued as ordinary is to receive a dividend of 5 per cent., and as preference 4 per cent. The special purposes fund clause appears. Power is asked to construct a tramway, and special regulations are to apply if the motive power is electrical. Sanction is required to the putting into force of a profit-sharing scheme. A stand-by clause reads as follows:

Where any person has a supply of gas laid on by the Company to any premises for which he has at the same time a separate supply of electricity or gas for power or other purposes, the Company shall be entitled to charge and receive from him, in respect of the supply of gas so laid on, such minimum sum as shall be fixed by them not exceeding 25s. for any one quarter of a year, notwithstanding that the ordinary

charge for the gas actually consumed in such quarter would amount to a lower sum: Provided that, in fixing the amount of such minimum charge, the Company shall have regard to the probable maximum supply of gas which might at any time be required for such premises: Provided also that in respect of any premises for which the whole supply of gas afforded by the Company is taken through a meter having a nominal capacity of less than ten lights, the amount of the minimum charge shall not exceed 5s. for any one quarter of a year.

The Company are asking power to themselves provide and work independent installations of gas and electricity, in these terms:

The Company may, at the request of the owner or occupier of any premises within the limits of supply which cannot conveniently or without undue expense be supplied from any existing main for the supply of gas from their authorized gas-works, provide and fix upon such premises, upon and subject to such terms and conditions as to payment and otherwise, as may be agreed between the Company and such owner or occupier, engines, motors, dynamos, generating and other apparatus, stoves, ranges, pipes, fittings, and appliances necessary, or convenient, for the purposes of the general supply, use, or consumption upon such premises of acetylene, gasolene, or suction gas, or any other gas, and may enter into and carry into effect contracts or agreements with any such owner or occupier as aforesaid for the working and use of any such engines, motors, dynamos, generating and other apparatus: Provided that nothing in this section shall exempt the Company from any indictment, action, or other proceeding for nuisance in the event of any nuisance being caused or permitted by them upon any such premises as aforesaid.

Another provision not often seen is this:

Notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give from any main a supply of gas for any purpose other than lighting in any case where the capacity of such main is insufficient for such purpose, or if, and so long as, any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes.

Among other miscellaneous clauses is one prescribing the use of Harcourt's ten-candle pentane lamp as the standard light in testing for illuminating power. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Tamworth Gas Company are asking for further powers. Under their Act of 1872, the authorized capital consists of £9600 in shares of £20 each, entitled to a maximum dividend of 10 per cent. per annum, of which 367 shares have been issued, and £18,840 in £20 shares, entitled to a maximum dividend of 7 per cent. per annum, of which 701 shares have been issued. Under the Act of 1872, the Company were empowered to borrow £2700, which power has been exercised to the full; and under the same Act, they are further entitled to borrow sums not exceeding £4700, after the whole of the capital of £18,840, carrying 7 per cent. dividend, shall have been issued. It will thus be observed that of the £9600 of 10 per cent. shares, only 367 shares of £20 each have been issued, and not the full number of 480. The difference between the two the Company now ask to be allowed to issue in manner provided by the 1872 Act for the issue of new shares. These particulars are from the preamble of the Bill. In the clauses, authority is asked to an extension of the limits of supply to Shuttington and Polesworth. On lands now in possession of the Company, it is desired to carry out extensions of the manufacturing plant. In addition to the £2260, balance of the original capital, that the Company wish to issue as new shares under the terms of the 1872 Act, power is asked to create and issue additional capital to the extent of £15,000, carrying one-third borrowing powers. The new clause applying to issues of capital by auction or tender is included in the Bill. On the additional capital the dividend is to be limited to 7 per cent.; and, on any part issued as preference, the dividend it is proposed shall not exceed 6 per cent. Repeal of the old quality and testing clauses is provided for; and it is proposed that the prescribed standard illuminating power shall be 14 candles, tested by the "Metropolitan" No. 2 argand burner. Preceding stand-by clauses referring to gas and electricity supplies [the same, with small verbal changes, as those quoted last week in the notice of the Chesham Bill] is one dealing with suction-gas users, as follows:

No penalty shall be incurred by the Company for neglect or refusal to give a supply of gas in accordance with the provisions of this Act to any company, body, or person who uses, or is in the habit of using, machinery or apparatus for making and utilizing suction gas, if, and so long as, in the opinion of the Company the giving of a supply by them to such company, body, or person, would interfere with or jeopardize the supply of gas by the Company for public and private lighting, and to consumers not using such machinery or apparatus as aforesaid.

The remaining clauses are all of the ordinary form. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Weston-super-Mare Gas Company were in Parliament in 1901, when their capital was converted or consolidated into £59,560 of consolidated ordinary 5 per cent. stock; and permission was given to the raising of £36,000 of additional capital. Of this there has been raised by way of ordinary stock £24,000, on which premiums amounting to £3483 have been received—thus leaving a balance of £8517. Borrowing powers have been exercised to the amount of £14,500. Sanction is now sought to the raising of additional capital to the amount of £80,000, to which the new form of auction and tender clause will apply. Dividend on this new capital, whether issued as preference or ordinary, is not to exceed 5 per cent. Inclusive of the sum already raised, borrowing powers to the amount of one third are requested. Authorization as to the construction and maintenance of works is embodied in the Bill. [*Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

AMMONIA IN ITS RELATION TO THE GASEOUS FIRING OF RETORTS.

By F. D. Marshall, Past-President of the Institution of Gas Engineers.

[A Lecture delivered before the Manchester and District Junior Gas Association on Jan. 7.]

No problem in chemistry has probably ever exercised such a fascinating influence over the minds of men engaged in chemical research as that connected with nitrogen. The very hoariness of the subject lends additional charm, for was not its derivative ammonia named after the temple of Jupiter Ammon in the Libyan Desert centuries ago? And yet, curiously enough, it was only in 1777 that Scheele discovered that ammonia contained nitrogen.

It is difficult to realize the important part nitrogen plays in our very existence. In all highly agriculturally cultivated countries men have been taxing our Mother Earth to almost the breaking point; until, weary and exhausted, she refuses to bring forth her increase unless recuperated and strengthened by a return of that which her children are daily wresting from her. In these hustling days, where crops succeed crops, time cannot be spared to allow our mother to recuperate slowly and gradually by the beneficent action of atmospheric nitrogen; and so, to keep her in health, we are forced to fall back on medicines in the form of artificial nitrogen. And, curiously enough, our dear Mother Earth does not resent the doses of the "tabloid" compounds!

Nature has given us a source of the recuperative nitrogen in the form of Chili saltpetre. But the supply, comparatively speaking, is exhaustible; and outside the Chili beds of this wonderful salt there exist, as far as present knowledge extends, no other deposits where a natural nitrification of sodium has taken place, if one may except a few small sporadic deposits in Uganda and elsewhere. Faced with this knowledge, and with the earth's daily cry for nitrogen and still more nitrogen, is it to be wondered at that brains are daily throbbing in the endeavour to obtain the life-giving element from artificial sources? The so-called solution of the "nitrogen problem" is one of the most captivating of all subjects pertaining to applied chemistry. Think just for a moment that Europe alone consumes over 2,000,000 tons of nitrate annually, and that, in addition, close upon 600,000 tons of sulphate of ammonia are likewise consumed, and some idea will be gathered as to the earth's craving. This craving will continue on a far more exaggerated scale as her family increases and the demand for supporting the existence of the teeming millions of her children becomes daily more imperative.

Since the nitrogen which naturally combined in the earth in the form of nitrates and in coal will not suffice for any great length of time to supply the growing demands of agriculture, can it be wondered at that scientific men have so longingly regarded the inexhaustible supply of free nitrogen in the atmosphere? To solve this mighty problem commercially has been the Mecca of the cleverest chemists the world has known; and that this lay within the region of possibility was demonstrated in the latter half of the Eighteenth Century by Priestly and Cavendish, who successfully proved that nitrogen and oxygen could be caused to combine by means of the electric spark. The extraordinary significance of this discovery was, however, only revealed by a knowledge of the circulation of nitrogen in the earth—that is, by the fact that the combined nitrogen passes in part into the atmosphere and is regenerated from it.

The utilization of this nitrogen, which constitutes four-fifths of the atmosphere, is inexhaustible, and, free of cost, opens up vast prospects.

A column of air covering about 2 acres is calculated to contain about 80,000 tons of nitrogen, or practically the amount which is imported into Germany (the largest consumer) in the form of saltpetre; and owing to the instantaneous readjustment of the equilibrium of the air, its removal would never be noticed. Can it be wondered at that this problem has been attacked so eagerly, both scientifically and technically? Time to-day quite precludes me dwelling on all that has been attempted or achieved; but come with me to Norway, the beautiful land of fjords and felds, and regard the results of the Homeric struggle which has taken place, and is taking place, between man and the forces of Nature.

Before man could hope to achieve the chemical conquest of the air, it was necessary for him to subdue the water and harness the mighty Norwegian waterfalls, which from time immemorial have poured their over a million fiery untamed horse power wastelessly to the sea, but now are as tame and tractable as circus ponies, and obedient to their master's demands. Can you fancy the mighty Hardanger falls, the Rjukanfos, the Boiliefos, the Vammafös now so harnessed that they are as easily under control as a bath tap? And what of these masters, these magicians, Professors Birkeland and Linde, and the genial engineer Mr. Sam. Eyde, who have at last succeeded in commercially burning the nitrogen in our atmosphere into nitric acid by the electric arc, and secondly absolutely detaching atmospheric nitrogen from its age-long companion oxygen, and of their brother magicians, Professors Frank and Caro, who have succeeded in forcing the nitrogen—oh, so unwillingly—by means of an intolerable electric temperature, into the companionship of other elements which in its pride of place it looks down upon!

Poor air, what it has to sufter! First, it is drawn into Mr. Eyde's drums and exposed to an electric temperature of 3000° C., emerging in a new garb as nitric acid pure and simple, and (again much suffering) it is drawn into the powerful Linde machines, where it is so harassed, pummelled, compressed, and frozen that, in very weariness of spirit, and in a state of perspiration to the point of absolute liquefaction, it parts with its old chum nitrogen, which, in its turn, is seized by the magician man and made to do his bidding. Can any page out of the book of the Romance of Science appeal more to your scientific imaginings than this?

And this Titanic struggle takes place in some of Nature's most beautiful surroundings, for nestling at the head of the Hardanger Fjord are the fine works of the United Alby Carbide Company—works as perfect in every respect as man and science can devise. Here the electric furnaces heated to over 1000° C. deal with a mixture of carbon and lime, which is subjected to a stream of the captive nitrogen—carbide of calcium being the result. This, in its turn, is transported to the neighbouring works of the North-Western Cyanamide Company, where the carbide of calcium is re-heated in electric furnaces in the presence of an additional stream of nitrogen, with a resultant product of nitrate of lime—termed nitrolim, or cyanamide—a most excellent fertilizer, and containing 25 per cent. of ammonia.

This cyanamide, when acted upon by superheated steam and under pressure, yields up its ammonia readily. At the present moment, the Nitrate Products Company, an affiliated concern, propose to utilize this ammonia for the production of nitric acid and nitrate of ammonia; and works are about to be erected on the Thames, near London. I am connected happily with this fascinating enterprise. Now I fancy I hear you muttering, What has all this, interesting as it may be to others, to do with us? First, we were informed that we were to listen to a discourse on "Gas-Works Construction;" then we were wheedled into coming here to gather something about the "Heating of Retorts; Past, Present, and Future;" and up to now it has been all Mother Earth and nitrogen!

"Wait and see!" It is your retort-furnaces and their bearing on the ammonia question that I have come to discuss. Apart from Chili saltpetre, apart from the air, coal, as you know as well as I do, is a huge magazine of nitrogen; and as you, as gas engineers, are daily handling and dissipating vast quantities, has it ever occurred to you that we are not rendering a right account of our stewardship in the form of the nitrogen entrusted to us? Estimating the production of "liquor" of the three principal London Gas Companies, the twelve suburban, and some twenty provincial undertakings, private and municipal, it may be taken that the production of 8 oz. liquor averages approximately 30 gallons per ton of coal. From the best authorities I have been able to consult, and from many analyses made by myself, the following table of the contents of nitrogen in various coals, and its equivalent in ammonia and ammoniacal liquor, may be regarded as very near the mark:—

Origin of Coal.	Percentage of Nitrogen.	Possible Yield of NH_3, Per Cent.	Possible Yield of 8 oz. Liquor Per Ton of Coal.
			Gallons.
Welsh	0·91	1·10	142
Lancashire	1·25	1·52	196
Newcastle	1·32	1·60	206
Scotch	1·44	1·75	226

Calculating that the companies and works indicated consume annually over 8,000,000 tons of coal, they must be losing, on a modest calculation, a possible 170 gallons of 8 oz. liquor per ton, containing, let us say, 1·5 per cent. of ammonia, we are simply staggered at the amazing theoretical loss. 170 gallons of 8 oz. liquor per ton equals 17,000 gallons per 100 tons. Commercially speaking, 100 tons of coal produce 3240 gallons of 8 oz. liquor, which represent a ton of sulphate. The loss therefore of 17,000 gallons of liquor per 100 tons of coal amounts to 5·2 tons; and this, on an annual consumption of 8,000,000 tons, is equivalent to a theoretical loss of 416,000 tons—almost the total European consumption—of sulphate annually, representing, at a profit of £7 per ton, the enormous sum of £2,912,000 annually.

Well, you will exclaim, Where has the nitrogen gone, and how are we to reclaim it? This is not a very difficult question to answer. It seems clear that, from an ammonia-producing point of view, our system of carbonization leaves much to be desired; but by carbonization in vertical retorts and in chamber ovens we may hope to win something back. Not much, however. It must be evident that the balance of the nitrogen in the coal not united by synthetic action with the hydrogen in the process of carbonization must exist somewhere; and there is no other place than in the coke and breeze. That it does exist in the coke and breeze, I have ample evidence to prove, as analyses show in the coke approximately 1·30 per cent. of nitrogen.

What has been done so far by our industry to husband this valuable element, which others are striving so feverishly to obtain? Absolutely nothing! It is either being given away in the coke or uselessly consumed in the coke and breeze used for retort-house work. It is, therefore, from the coke that we must endeavour to reclaim it; and modern science indicates the way clearly and commercially. In my mind's eye, I can foresee a time when the demand for gaseous fuel will be so great that coke, excellent fuel as it undoubtedly is, will be a superfluity, and will, in its turn, be distributed in the form of gas. Why not let us begin on the lines I am about to indicate at once?

At the commencement of our industry we were accustomed to heat our retorts by the wasteful open-grate system; but this we may consider to be abandoned in favour of the excellent generator or internal-producer system, fed by a heated air supply. And we have got as near perfection in this respect as is possible. It is, in fact, gaseous firing by small self-contained producers. The only engineer I am aware of who has made an attempt to depart from this system, and to heat his retorts by an outside producer, is Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, and every credit is due to him for this bold departure. As far as can be gathered, he is quite content with the experiment; but I often wondered why he did not go a step further, and, at the time he gasified his fuel, did not attempt, by a suitable generator, to recover the nitrogen (in the form of ammonia) contained in the fuel.

If we review what has taken place in recent years in nearly all iron and steel works, foundries, glass, chemical, china, salt, and other works, to say nothing whatever of power installations, every other form of heating has been abandoned in favour of outside producers supplying gaseous fuel. Open-grate firing and even Siemens regenerators are giving place to the new fuel, and, in many of the installations, the recovery of the ammonia is a *sine quâ non*—thus reducing the cost of the fuel considerably. Surely the fact—outside retort-house generators, in delivering a regular stream of an intensely heating fuel, under perfect control at all times, dispensing with labour, clinkering, and a large amount of wear and tear, and beyond all, enabling one to reclaim a considerable portion of the elusive nitrogen in the form of ammonia—must appeal to every one of us.

Mr. Charles Carpenter has demonstrated that there is no difficulty in heating the retorts; and I shall be able to convince you that, with another type of generator and an ammonia recovery plant, there will be no difficulty in obtaining over 80 to 85 lbs. of sulphate ammonia per ton of fuel gasified, and the bulk of this fuel will be breeze. Last year, my colleagues, with whom I am associated in this matter (perhaps the greatest experts in producer gas in the world), submitted the following estimates to a certain gas company, and the figures were backed up by guarantees. It was laid down that the works in question were using 12 tons of coke per 100 tons of coal carbonized in first-class generators. The quantity of coke consumed in this way amounted to 14,227 tons. The percentage of coke to breeze was taken at 80 per cent. coke, and 20 per cent. breeze. The selling price of the coke was 17s. per ton; of the breeze, 5s. per ton.

As 60 tons of fuel were required for the generator daily, and as only a certain quantity of breeze was available, it was suggested making up the difference with slack at the high figure of 12s. per ton in the proportion of 22 to 23 tons of breeze to 37 to 38 tons of slack. The financial results were estimated as follows:

DEBIT.

Labour Maintenance—	
Repairs, at 2s. 6d. per ton of fuel gasified	£2,613
Fuel, breeze, and slack for producer	7,311
Acid, 743 tons, at 25s. per ton	929
Fuel, for boiler, 5766 tons of slack, at 12s.	2,964
	£13,817

CREDIT.

743 tons of sulphate at £11 per ton	£8,173
497 tons of tar at 10s. per ton	248
14,227 tons of coke released for sale at 17s.	12,093
3557 tons of breeze at present used at 5s. 6d.	976
	£21,490

TOTAL CREDIT.

Gross saving, per annum	£7673
Less depreciation, 5 per cent. on £16,280	814
Net saving per annum	£6,859

Total cost of installation £17,500, saving 42 per cent. per annum on investment.

These figures are neither fanciful nor fantastic, but are based on a sound practical knowledge of what producer gas has done for other industries, and every detail of the apparatus required has been well thought out and is ready to hand. Should coke fall to 10s. or 12s. per ton, there would be no reason to purchase slack, as the nitrogen contents of both are not dissimilar—being 1·26 per cent. of nitrogen in the coke, 1·24 per cent. in the breeze, and about 1·30 per cent. in the slack. But it must be clear to you that, at 17s. per ton, it would be more profitable to purchase slack at 12s. both for firing retorts and for the recovery of ammonia. Even assuming that the recovery of the ammonia be left out of the question, it would still be more advantageous to heat the retorts by gaseous fuel produced in an independent producer rather than by the present method. Outside producers with ammonia recovery attachments could perhaps only be employed in works of magnitude; but for moderate-sized works, a producer *minus* the ammonia plant could, I am sure, be profitably employed. By outside producers it must be understood that a single producer placed outside a retort-house supplies hot gaseous fuel to every setting from a trunk service main. The supply to each setting is regulated by a valve attached to the branch pipe from the main supply. The sulphate of ammonia is recovered during the progress of the fuel gas through its condensing apparatus before the gas is utilized in the settings.

You will probably inquire, If we should eventually be able to produce double or three times the quantity of ammonia more than we are producing at present, surely this great influx would depreciate the markets? I do not believe for one moment that it will be so. During the last ten years, the consumption of nitrate has more than doubled; and the same may be said of sulphate. There is no falling off in the demand; on the other hand, every known source of nitrogen is being exploited—from the air, from peat, from coal, and, sooner or later, from coke. Why Canada alone will, in course of time, consume all the nitrogen we now produce. The still barren lands of Russia and Hungary will soon be crying for fertilizers. Man's demands are imperative; and, as I have pointed out previously, the earth cannot be impoverished without compensation, and the Ruler of all Things has indicated where this compensation lies. At the present moment you are being left behind in the ammonia race. You are among those who "also ran." The gas-works of the United Kingdom are only producing a percentage of the ammonia required—more, much more, will be required of them in the future. Does it stand to reason that the "magicians of the air" who are spending millions, and coke-oven companies hundreds of thousands, would do so if they thought there would be a falling off in the demand? Produce fourfold what you are now producing, and every ton will find a profitable market value for years and years to come

If you have been disappointed in the matter of an address on gas-works construction, I sincerely trust that the subject of this discourse will afford food for thought. There are men much better qualified than I am to talk to you about gas-works construction. It is at the best a dry topic, bristling with *z*'s and *y*'s, and brimming over with controversial matter. I wanted to make this a Christmas address, taking you in thought for a little time out of your daily routine of thought to a new and fascinating subject, yet commercially profitable withal, because there is not much room nowadays for romance in our scheme of life, alas! unless the £ *s. d.* is the ultimate outcome! We are hard pressed nowadays, and cannot leave a stone unturned which is likely to benefit our industry. We are, in my opinion, only upon the threshold of the science connected with the carbonization of coals and the production of coal gas. We must forsake old and time-worn ruts; we must follow with an intense keenness what is being effected in kindred industries. We are slow to move in the old country; but move we will. We must demolish the old fetish of illuminating power, with its ancient parliamentary "dips," and its hocus-pocus juggle argand burners. We must fall into line with our Continental neighbours, and set up a new image in the form of a calorimeter. Non-illuminating heating gas produced in bulk is what the future demands; and to introduce this we must apply every nerve and combination in our power.

To my younger friends of this Junior Association, I would fain conclude with a few words of advice. Let the chemistry of your profession be the guiding star. Spend every possible hour in your laboratories, study foreign languages, and devote every energy to the capture of that "Elusive Pimpernel" nitrogen.

MANCHESTER UNIVERSITY LECTURES.

The fourth lecture of the series arranged to be given in the Manchester University on gas topics was delivered on Saturday afternoon before a large company, including leading members of the Manchester District Institution of Gas-Engineers, and the Manchester and District Junior Gas Association. The lecturer for the afternoon was Mr. F. D. Marshall, a Past-President of the Institution of Gas Engineers, and late Chief Engineer to the Danish Gas Company, who had for his subject "Ammonia in its Relation to the Gaseous Firing of Retorts." It should be added that Mr. Marshall had consented at somewhat short notice to deliver this address in consequence of a re-arrangement of the syllabus. The chair was occupied by Alderman FERNLEY, J.P., the Chairman of the Stockport Corporation Gas Committee.

Alderman FERNLEY, in opening the proceedings, said that, when asked to take the chair, he felt he could not very well refuse, because he had read with interest of the doings of the Junior Gas Association, and had been impressed by the enthusiastic and scientific manner in which they did their work. Therefore, he thought, as Chairman of the Stockport Gas Committee, he should show his appreciation by accepting the invitation extended to him to preside that afternoon; and, in his opinion, chairmen of other gas committees might well do the same. He then called upon Mr. Marshall to deliver his lecture.

Mr. MARSHALL, at the outset, said that, being called upon at the eleventh hour, as it were, to deliver a scientific lecture to an audience such as he had before him, he found himself rather in a difficulty. Then again came the question of a subject, and its title. He hoped that the subject he had chosen would be of interest to them. He then proceeded with his lecture, which will be found on p. 90.

Mr. C. E. TEASDALE, in moving a vote of thanks to the lecturer, said they were deeply indebted to Mr. Marshall for giving them such a brilliant send-off in their New Year's programme. The impression left was that the subject had been dealt with by a master mind, combining theory and practice, which went to give efficient and practical results. They were also grateful to Mr. Marshall for having come forward, as he put it, at the eleventh hour to address them. There had been a change in the programme, it was true; but he was of opinion that none present would regret the change. The coming among them of such eminent men was a compliment which the juniors, whom he represented, appreciated very much; and they could not express their feelings too fully in this respect. The lecture they had listened to was not only an interesting one, but a fighting one. It would make them think; and in thinking, they would see how backward they had been in this matter.

Mr. W. WHATMOUGH (Heywood) seconded. The address, he said, had shown that Mr. Marshall was not only familiar with his subject, but was an enthusiast. He thought the lecturer also had shown great courage in putting his views before those who had to do with gas-works construction. The occasion reminded him of a paper read many years ago before the Gas Institution by Mr. Marshall on the Monier system—a paper that was subject to a good deal of criticism. Mr. Marshall was a pioneer then; and he was a pioneer that afternoon. What was more, Mr. Marshall had given evidence that he had the courage of his convictions. He (Mr. Whatmough) had not the slightest doubt there would be a development in gas-works in the direction Mr. Marshall had indicated. He was rather sceptical about the price for nitrogen advancing, as stated by the lecturer, with its increased production. Of course, if it did, it would bring great comfort to their souls.

The motion was then put, and carried with loud applause.

Mr. MARSHALL, in reply, confessed to having had some diffidence in coming before such a gathering with the subject chosen. A Birmingham friend to whom he mentioned the matter said: "You will have some hard nuts to crack up there." Whatever nervousness he had felt, however, had been dissipated by the hearty welcome they had given him. Great applause greeted his offer to furnish with letters of introduction members of either Association who, going to Norway for a holiday, desired to visit the works he had referred to in the course of his address. He felt certain that those who did visit the works would return imbued with the same enthusiasm as himself in the study of this question of nitrogen.

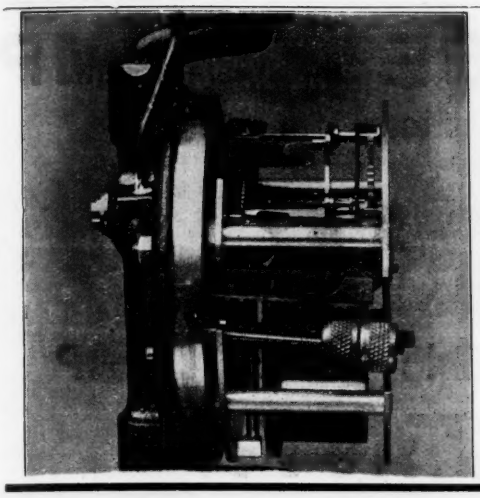
Mr. T. G. MARSH (Manchester) proposed a vote of thanks to Alderman Fernley for presiding. He said the fact that to-day gas magnates took an interest in the junior members of the profession led him to think of the change that had taken place in the last forty years. In old days, the seniors did not show that interest in the juniors, generally preferring to keep the special knowledge they had to themselves. He welcomed the change; and it was also a satisfactory thing to find municipal councils giving their support and sympathy to the younger members of the gas profession. They were deserving of support from that quarter. He knew men who gave up their time, which might be spent more pleasurably, if not more profitably, to the study of subjects relating to the profession in which they were engaged. He was sure Alderman Fernley had been as much interested in the lecture that afternoon as most of those present. The subject had been put before them very clearly; and he was not at one with those who believed that in the future the demand for nitrogen would be less. In fact, he believed that, as the supplies increased, the demand would be exceeded by the supply. As the population grew, it would become absolutely necessary for them to produce more nitrogen than they did at present, to feed the land. He was pleased to see chairmen of gas committees were attending such gatherings as this, chiefly because they would find the ideas of the promoters were unselfish, and that the aim of them all was simply to improve themselves.

Mr. H. KENDRICK (Stretford) seconded the motion. It was a matter for congratulation to the two Associations—the Seniors and the Juniors—that chairmen of gas committees in the Manchester district had accepted the invitation to attend these meetings and preside over their deliberations. It showed the interest these gentlemen took in the work of the concerns over which they presided; and it was very much to their credit. As Mr. Marsh had said, they wanted such support—not only their moral support, but support in a more practical fashion, in order that the work which the Associations had taken in hand could be carried out to its fullest extent. They were desirous that these lectures should be continued from year to year, not only there, but throughout the length and breadth of the land. In this way, the gas industry would benefit; and instead of being looked down upon as mere "rule-of-thumb" workers, as in the past, gas engineers would be recognized as belonging to a great scientific industry, indissolubly linked-up to the great Universities of the country. He would like to see the various corporations and gas companies come forward and provide the "sinews of war" for this work, instead of the money having to be found by the Associations.

The resolution having been carried,

Alderman FERNLEY responded. He repeated his previous observations about the interest he took in the work of the Junior Gas Association, and added that, as Chairman of the Stockport Corporation Gas Committee, he would be pleased to advise that authority to give a reasonable donation to the funds of the Association, if others would do the same. He thought it was their duty to do so, if it would be to the good of the Association.

At a short meeting of the members of the Junior Association, held subsequently, a vote of condolence was passed (on the motion of Mr. THORP, the President) with the family and relatives of the late Mr. H. Rothwell, a member of the Council of the London and Southern District Junior Gas Association.



THE IDEAL LIGHTER AT LAST.

The "Automaton" Lamp Controller

can now be seen in active operation at

39, Victoria Street, Westminster, S.W. (1st Floor).

YOUR CRITICAL INSPECTION IS CORDIALLY INVITED.

FULL PARTICULARS OF

AUTO-LIGHTER, Ltd., 17, Victoria St., Westminster, S.W.

CAST IRON PIPES FOR GAS OR WATER.

MADE IN DIAMETERS, 2 in. to 80 inches. 8000 to 10,000 TONS IN STOCK.

GAS COOKER PARTS

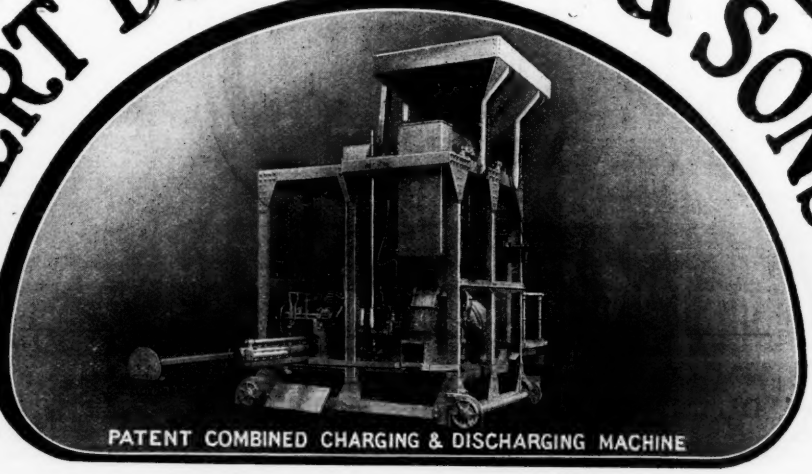
We can make your Stove Department show a big increase in profit.

Send us Trial Order for:—Burners and Deflectors, with Samples.

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

A. G. CLOAKE,
54, HOLBORN VIADUCT, LONDON, E.C.

ROBERT DEMPSTER & SONS LTD



PATENT COMBINED CHARGING & DISCHARGING MACHINE

· ELLAND ·

In operation at Falkirk, Stirling, Kilmarnock, Dumfries, and Bilston.

The LATEST and BEST LAMP

FOR PUBLIC LIGHTING

IS

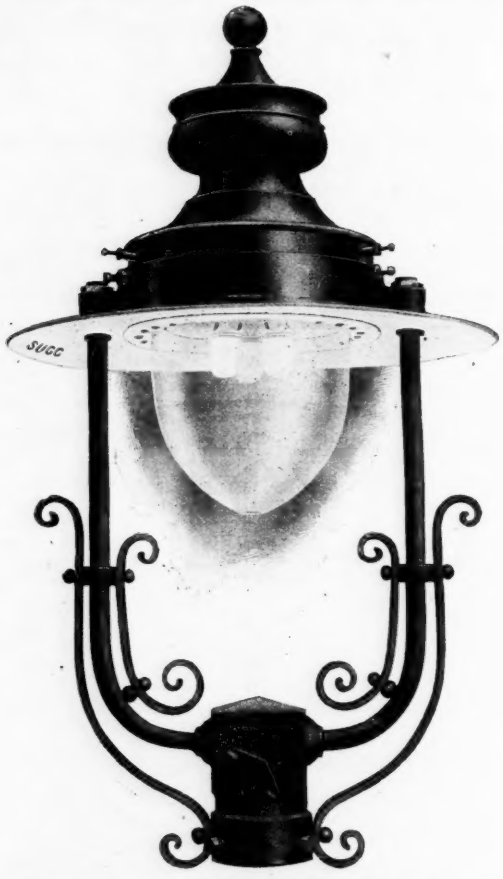
SUGG'S

INVERTED INCANDESCENT GAS LAMP

THE "REGENT."

WITH UPRIGHT FIXING FOR STREET COLUMNS.

Made in various Sizes from 180 to 1600 Candle Power (for Ordinary Pressure of Gas).



For Lighting—

Street Refuges,
Squares,
Promenades,
Parks,
Avenues,
Public Buildings,
&c., &c.

For Lighting—

Railway Stations and Sheds,
Goods Yards,
Docks,
Wharves,
Piers,
&c., &c.

SPECIAL FEATURES.

1—LOW MAINTENANCE COST.
2—HIGH DUTY IN ILLUMINATING POWER.
3—STRONG CONSTRUCTION.
4—FINE APPEARANCE.
5—PROVISION OF AIR AND GAS ADJUSTERS TO EACH BURNER.

PLEASE SEND FOR ILLUSTRATED PRICE LIST WITH FULL PARTICULARS.

WILLIAM SUGG & Co., LIMITED, ENGINEERS, WESTMINSTER.

Telegrams: "SUGG, LONDON." Telephones: 5153 (2 lines) WESTMINSTER.

GAS REFEREES' "NOTIFICATION" FOR 1911.

THE "Notification" of the Metropolitan Gas Referees for the current year, which was issued last Thursday, contains fewer alterations than its immediate predecessor; and, as before, the principal ones are indicated by the use of italics.

In the directions regarding the testing of gas for illuminating power, an explanatory note is put to the closing sentence in the paragraph indicating how each test is to be made. The mean of the four readings of the photometric scale is to be multiplied by the number of seconds in the time recorded, and also by the aerorthometer reading, and divided by 120. The quotient is the illuminating power, which should be stated to the nearest hundredth of a candle. The Gas Referees add this note: "No correction is needed on account of the slight variations in the light of the standard lamp caused by the natural changes in the pressure and humidity of the atmosphere, because the light of the gas-flame varies similarly from the same causes." In the directions for testing for sulphur compounds other than sulphuretted hydrogen, it was specified in the preceding "Notification" that, as soon as the testing had been started, a first reading of the aerorthometer was to be made and recorded, and a second reading as near as possible to the time at which the gas was shut off. It was stated that the rate of burning, which with practice could be judged very nearly by the height of the flame, was to be adjusted, "by timing the index to the meter, to about half a cubic foot of gas per hour." According to the present "Notification," the rate of burning is to be so adjusted "that the meter hand shall make half-a-revolution in not less than four minutes."

The directions for testing the calorific power of gas have been amplified by the insertion of the following particulars:

> A unit of heat, termed a "calorie," is the amount of heat which will raise the temperature of a litre of water 1° C.
>
> The heating or calorific power of any sample of gas is represented by the number of calories produced by the combustion of one cubic foot of such gas measured at 60° Fahr., and under a pressure of 30 inches of mercury.
>
> When the products of combustion are cooled before they escape, the heat imparted includes that which is due to the condensation into water of some of the steam formed by combustion, and that which is due to the cooling of the water thus formed from its boiling-point to a lower temperature.
>
> The maximum calorific power which gas can thus exert is determined directly by the calorimeter. This is a true measure of the total heating power, and is termed the gross calorific power of the gas. But in many cases in which gas is used as a heating agent the steam which is formed escapes into the air uncondensed; and thus the heat due to the condensation of the steam and the cooling of the water so formed is not utilized. The amount of heat thus lost can be estimated; and if it is subtracted from the total heat yielded by the combustion of gas in the calorimeter, another value is obtained which is termed the net calorific power of the gas. Since, however, when steam escapes uncondensed, the uncondensable products of combustion also pass away at a high temperature, and since the loss of heat thus arising is commonly the greater of the two, the customary partial correction from gross to net has not much significance.

Appendix L contains, as before, an illustrated description of the calorimeter designed by Mr. C. Vernon Boys, F.R.S., one of the Gas Referees; and to the example given for calculating the calorific power of gas, several explanatory remarks have been added. Apart from these, the appendices stand just as in the preceding "Notification."

THE GERMAN TAR INDUSTRY.

A REPORT has just been issued by the Imperial Secretary of State, on the "German Tar-Distilling Industry," giving the returns for coal-tar, water-gas tar, and oil-tar distilleries. According to the report, there were in 1908 seventy-five works, of which seventy-two furnished returns. Of one undertaking, the production could be estimated; but for the two remaining ones, no data were available. As these works are of no importance, they were not considered in the computation.

The total quantity of tar worked up amounted to 811,977 metric tons, of an approximate value of 18·9 million marks (£945,000). Of this, 593,522 tons, of a value of 13 million marks (£650,000), was tar from coke-ovens, 207,235 tons, of a value of 5·2 million marks (£251,000), coal tar from gas-works; 3095 tons, of a value of 0·1 million marks (£5000), water-gas tar; and 8125 tons, of a value of 0·3 million marks (£15,000), oil-gas tar. As the quantity of tar produced in German bye-product coke-ovens during 1908 was 632,378 tons, it will be seen that nearly the whole production of coke-oven tar was worked up in German tar-works.

The quantity of intermediate products worked up was 45,224 tons, of a value of 3·7 million marks (£185,000). This figure is composed of 18,814 tons, of a value of 0·8 million marks (£40,000), of heavy tar oils, including carbolic, creosote, green oil, anthracene oil, &c.; 16,570 tons, of a value of 2·3 million marks (£115,000), of crude benzol; 6768 tons, of a value of 0·2 million marks (£10,000), of crude naphthalene, anthracene, and residues; 1947 tons, of a value of 178,000 marks (£8900), of light oils (benzol, &c.); 793 tons, of a value of 215,000 marks (£10,750), of crude carbolic oils; and 325 tons, of a value of 10,600 marks (£530), of other products, including pitch.

The materials worked up, tar and intermediate products, were almost exclusively of inland manufacture, only water-gas tar was principally imported from abroad. The imported gas liquor contained 849 tons of ammonia, and had a value of 0·4 million marks (£20,000). The total value of the products made was 35·8 million marks (£1,790,000). In this figure, pitch is represented by 13 million marks (£650,000), or 36·2 per cent.; heavy tar oils, by 10 million marks (£50,000), or 27·9 per cent.; prepared or distilled tar, by 3·1 million marks (£155,000), or 8·6 per cent.; naphthalene, by 2·7 million marks (£135,000), or 7·5 per cent.; benzol, crude, distilled, and pure, by 2·2 million marks (£110,000), or 6·2 per cent.; and the remaining products by 4·8 million marks (£24,000), or 13·6 per cent.

The products were:

	Tons.	Marks.	£
Pitch	402 676	12,986,224	649,311
Prepared tar distilled, pure	83,706	3,076,842	153,807
Heavy tar oils, including carbolic, creosote, and naphthalene oils	248,103	9,986,451	499,323
Naphthalene, crude	19,713	920,977	46,050
Naphthalene, pure	16,684	1,792,718	89,134
Anthracene, crude, semi-crude, and pure	4,026	646,008	32,304
Pyridine bases	385	253,807	12,690
Phenols, creosoles, &c.—			
Phenol (carbolic crystals)	1,000	856,578	42,829
Cresols (90, 95, or 100 per cent. carbolic)	2,081	388,989	19,450
Crude phenols	581	98,008	4,900
Benzol, crude and pure	13,229	2,204,518	110,225
Toluol	2,601	776,473	38,823
Xylol (heavy benzol, crude, and rectified)	4,717	792,695	39,635
Other products of the tar, tar-oil, and benzol manufacture	4,160	276,949	13,847

	Quantity. Tons.	Ammonia. Tons.	Ammonia. Per Cent.	Marks.	£
Concentrated ammonia liquor	118	24	203	29,500	1,475
Sulphate of ammonia	1174	286	244	296,118	14,806
Liquor ammonia	935	206	220	418,309	20,915
Chloride of ammonia	59	18	305	24,608	1,230

It must be pointed out that the capacity of the German industry for the production of naphthalene, anthracene, pyridine bases, phenols, creosols, benzols, toluols, xylols, solvent naphtha, heavy benzols, and other products, is greater than appears from the result of the actual production. The producing capacity is not fully utilized on account of conditions of trade, and some of the products mentioned are also manufactured in works other than tar-works. The figures therefore do not represent the whole of the production of these products.

New Chemical Laboratories at University College.

For some time past, the inadequacy of the chemical laboratories in connection with University College, in Gower Street, has been recognized; and two years ago an effort was made to raise a fund for the erection of new buildings. Unfortunately, the proposal has not met with satisfactory support. A Committee, of which His Royal Highness Prince Arthur of Connaught is President and Sir Henry Roscoe Chairman, issued, with the approval of the Senate of the University of London, an appeal at the beginning of 1909 for a sum of £70,000 to purchase a site close to University College, and to erect thereon new chemical laboratories. The option given to the College authorities expired on Christmas Day; but an extension has been made to the 31st inst. Up to the present, a sum of only £14,000 has been subscribed (some of it conditionally); and unless the required £25,000 for the purchase of the land is raised before the close of the present month, the opportunity of acquiring the site will be lost. Among the principal donors to the fund up to the present are the South Metropolitan Gas Company, for £500, and Mr. Charles Hawksley, for £250. Donations or promises may be sent to His Royal Highness the President of the Committee, at University College, Gower Street, London.

The next meeting of the Illuminating Engineering Society will be held at the Society of Arts (John Street, Adelphi), on Monday, the 16th inst., at 8 p.m., when a discussion will take place on the subject of Library Lighting. The Library Association is co-operating with the Illuminating Engineering Society in connection with this discussion, and the meeting will be attended by members of both bodies.

In view of a decision come to by the County Council of the West Riding of Yorkshire to reduce their grant to the University of Leeds from £4500 to £3375, the Court of the University have addressed to the Council a memorial on the subject, appealing to them not to carry their decision into effect. Towards the close of the memorial, the Court point out that the confidence of outside bodies in the University has been shown by such noteworthy incidents as the choice of the University as the recipient of the Livesey Professorship Endowment for a Chair of Coal Gas and Fuel Industries, by an additional grant of £5000 for buildings from the Clothworkers' Company, and by the completion of the £100,000 fund which the Privy Council required,

THE CHEMICAL TRADE DIRECTORY.

We have received from Messrs. Davis Bros., of No. 265, Strand, proprietors of the "Chemical Trade Journal," the fourth edition of their "Chemical Trade Directory." The contents are divided into three sections. The first consists of an alphabetical list of names of chemical manufacturers, merchants, brokers and agents, and makers of chemical plant and materials in Great Britain and Ireland, with their full addresses. The second section contains classified lists of chemical products, &c., with the names and locations of the makers; the arrangement adopted enabling one to see at a glance how many makers there are of any particular product. The third section, which is an entirely new one, comprises much information useful to those engaged in the chemical trade. It opens with the text of the Alkali Act, 1906, which is followed by an abstract of the last report of the Chief Inspector. Next come a number of abstracts of legal decisions, the "Census of Production" returns for 1908, and an interesting series of price diagrams, one of which, showing the fluctuations in the price of tar, &c., we have received permission to reproduce. These are followed by tables showing the exports and imports of chemicals, &c., for the years 1907-9; and the section closes with an abstract of the Factory and Workshop Act, 1901. The additions just indicated greatly enhance the value of what was before a very useful work of reference; and its general appearance has been improved by the substitution of linen binding for paper boards. The price of the book is 10s. net, post free.

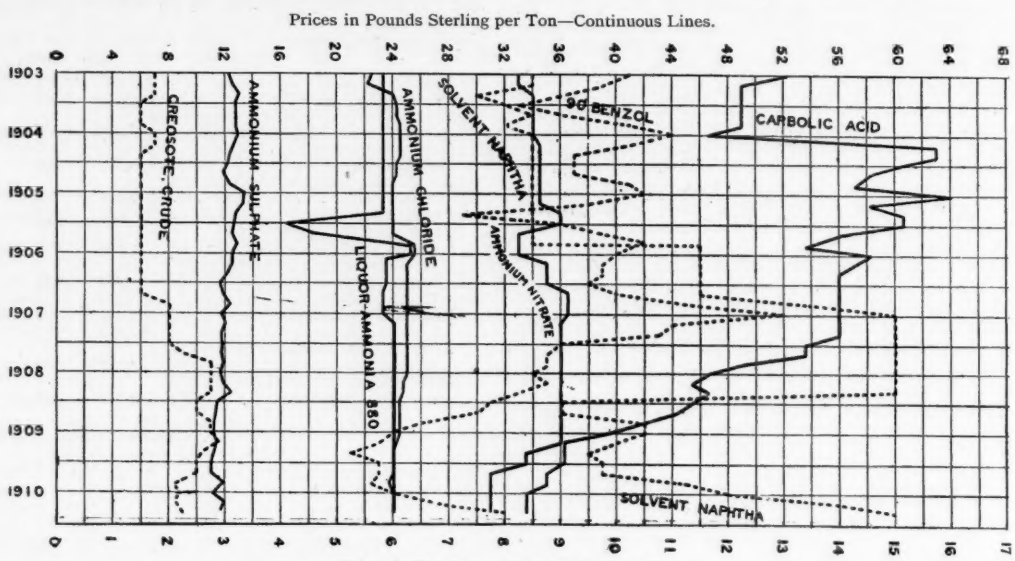


DIAGRAM OF TAR AND AMMONIA PRICES FROM THE "CHEMICAL TRADE DIRECTORY."

HIGH-PRESSURE GAS FOR WORKSHOPS.

A summary of a paper by Herr F. Messinger, the Gas Inspector of Charlottenburg, on "The Use of High-Pressure Gas for Industrial Purposes," was given in the "Journal" last week, p. 41. The article referred solely to the use of high-pressure gas for heating purposes. The "Zeitschrift für Beleuchtungswesen" reports, however, a lecture which Herr Messinger delivered before a crowded meeting of the German Gas Technicians League, which was held on the 8th ult., in Berlin, under the chairmanship of Herr Carl Tormin. The subject of the lecture was "High-Pressure Gas from the Same Service for both Factory Lighting and Industrial Work."

The author first referred to the success attained by high-pressure gas in the public lighting of large towns. He mentioned the economy of this method of lighting relatively to others, in order to demonstrate the advantage to be gained by its adoption also for factory lighting. He quoted examples, and showed suitable types of plant for the purpose. There was in operation in the room a small Keith blower which worked so quietly that it did not interfere with the lecture. To this were connected a Graetzin high-pressure gas-lamp of 500-candle power, consuming about 8·8 cubic feet of gas per hour, as well as two factory high-pressure lamps of the German Keith Light Company, each affording a light of 180 candles with a consumption of about 3·2 cubic feet of gas per lamp per hour. These high-pressure lamps burned quietly and with a high intensity. The lecturer specially drew attention to the fact that they could, like electric lamps, be lighted up from a distance, and could be lowered to the ground, if required.

The lecturer next referred to the use of high-pressure gas in factories and workshops for heating and industrial purposes. He showed a large collection of high-pressure gas furnaces, burners, soldering irons, &c., all connected to the high-pressure gas-service, by which he was enabled to demonstrate the use of them. A noteworthy feature of the exhibits was the burner with regulating nipple devised by Dr. Fink, which was described in last week's "Journal" (p. 41). Soldering and brazing were carried out in the course of the lecture with the new high-pressure gas-soldering bits and the blast burners at a consumption of about 2·7 cubic feet of gas per hour. Specially interesting was the soldering of sheet aluminium and aluminium castings by means of a new aluminium solder brought out by the firm of Grubers, of Berlin. A new type of automatic temperature regulator, known as the "Aute," was also shown in use.

The lecture was followed by a discussion, in which Herr Rümber, of the German Welsbach Company, Herr Albrecht, of the Central Organization for the Promotion of the Sales of Gas, and Dr. Fink, of Berlin, all took part. At the conclusion of the discussion, an address was given on "The Evolution of the Incandescent Mantle by the German Incandescent Gas Company," and the meeting closed at a late hour.

The Midland Junior Gas Association will meet next Saturday afternoon, when a paper will be read by Mr. W. G. Pickering, on the "Development of Incandescent Gas Lighting." This will be illustrated by lantern slides and specimens. A "coffee meeting" will be held subsequently.

Sulphate of Ammonia from Peat.—At the meeting of the Power Gas Corporation last Tuesday, the Chairman (Sir Alfred Mond, Bart., M.P.) stated that the plant which they had put up in Italy some time ago to operate on peat, recover sulphate of ammonia, and make gas to supply an electric central station had been in operation with entirely successful results for a considerable time; and there was a prospect of very great development. It was really an interesting economical use of a fuel existing in many parts of the world; and he thought the Company could claim to be the first people who had really economically solved the problem.

The Humphrey Pump.—A Company is now being formed in the United States, with a capital of $1,500,000, to manufacture the Humphrey pump and compressors in America. It may be remembered that an installation of these pumps is to be erected in connection with the new reservoir now being built at Chingford for the Metropolitan Water Board. It will include five pumps, with a total output of 180 million gallons a day—an amount which is equal to more than two-thirds of the whole water supply of London and the suburbs. Four of the pumps will each be capable of delivering 40 million gallons daily; and on each explosion ten tons of water will be raised.

Hazell's Annual for 1911.—We have received from the proprietors, Messrs. Hazell, Watson, and Viney, Limited, of Long Acre, the above-named useful work, the publication of which has been delayed in order to allow of the inclusion of a history of the present year's Parliament, and a complete guide to the new House of Commons. For convenience of reference, the latter is printed on paper of a distinctive colour. The "Annual" has reached its twenty-sixth year, and the nature of its contents its well known to most of our readers. In the present issue there are many new subjects; while the general matter has been carefully arranged to facilitate consultation. This is further assisted by a good index. The "Annual" fully justifies the claim made for it of being an almanac and an encyclopædia in one.

FLAME STANDARDS USED IN PHOTOMETRY.

Discussion of Messrs. Rosa and Crittenden's Paper.

In the "JOURNAL" last week (p. 32), we gave the text of a long paper on the above-named subject presented by Dr. E. B. Rosa and Mr. E. C. Crittenden at the fourth annual convention of the American Illuminating Engineering Society. The following is a summary of the remarks to which it gave rise.

Dr. ROSA said he should like to offer a few observations on a point which had not been mentioned in the paper—viz., the sensitiveness of the pentane lamp to draughts in a room. It had been found that, even when the flame was carefully screened, draughts might produce changes in candle power. These were due to the fact that the air circulation depended upon the difference in the temperature between the tubes; and a slight draught, or a little higher velocity of the air around the lamp, would cool the tubes to a different extent, and change the circulation of the air and the illuminating power of the light accordingly. It was necessary, therefore, that there should be a standard method of ventilating the lamp—in other words, it should be contained in an enclosure which should be standard and should be indicated in the specifications; and the method of observing the humidity and of controlling the lamp should be standardized as carefully as was the construction of the lamp itself.

Mr. W. H. GARTLEY remarked that electrical people were interested in a uniform fixed standard from quite a different point of view from that of gas people. The candle power of gas had been made a criterion of its quality; and it would be a matter of great concern to the gas companies if there should be any alteration in this respect, as most probably 75 per cent. of all the gas made in America was tested according to its illuminating value. If a primary standard could be so arranged as to exclude every possible source of variation, as the authors had suggested, and lamps could be sent to the Bureau for standardization, an ultimate *desideratum* would have been reached. But a primary standard could not be handled with the care required, nor could it be employed by a gas company without entailing very large expense. The standard used by the gas company must have some latitude as to the atmospheric condition under which it was employed. A large portion of the gas that was being used that day was probably made before six o'clock in the morning. If atmospheric conditions were going to affect, as they were known to do, the light emitted by the gas, it would be impossible to forecast what they would be from 12 to 16 hours before the time of actual burning. The gas must therefore be tested with a satisfactory standard that would exactly change in value with the gas-flame under the varying conditions. The pentane lamp, as tests which had been made showed, varied with the change of atmospheric conditions probably more than did any other standards, particularly the Hefner, for the reason that flames of about the same candle power were affected in a general way to a like extent. Consequently, a 10-candle pentane lamp would be affected more than the Hefner lamp—more nearly like the 20-candle gas. But another condition of affairs was arising. The calorific value of gas was being considered more and more; and there had been legal enactments throughout the country by which this was made the standard by which the quality of the gas was to be measured. Of course, this fact did not lessen the necessity of having a good primary standard; and he believed it would be just as much used as ever.

Mr. F. N. MORTON asked whether, in the statement of the humidity of the air as so many litres of moisture per cubic metre, the result was expressed per cubic metre of dry air or of the air as it existed.

Mr. F. E. CADY wished to know if any study had been made of the effect of barometric pressure and humidity on the flame, when the normal height was 45 mm. instead of 40 mm. In other words, was the flame any more sensitive to changes in barometric pressure and humidity when at a height of 45 mm. than when at the ordinary flame height? In the case of flame standards having a cylindrical flame, what was to be taken as the centre of radiation in measuring the distance? What was the present attitude of the Bureau of Standards in regard to the Carcel lamp?

Dr. A. H. ELLIOTT asked the authors if they had tried any other wick material in the Hefner lamp than the one furnished. He said he had made some experiments in this direction, and found that a common cotton lamp wick could be used as a substitute for the Hefner wick without making any difference. He was rather glad the Hefner unit had come out in front in the investigation, because he had not been successful with the pentane lamp for several years; and this was the case with a great many people. The authors corroborated observations he had made, that the vapour of the pentane came out at the top of the lamp; and if one was not careful, it would take fire from the lamp below. He did not think this fact was a recommendation for the lamp. He had never heard of an accident with the Hefner lamp, which he found an excellent standard, notwithstanding the fact that it was very small. The time of lighting as affecting the candle power of the pentane lamp was far more serious than a great many people thought. He found it was a variable quantity. It might take 45 minutes before the lamp was steady. The change in the form of the flame was another difficult thing, which probably accounted for the variation in illuminating power. Then the air and vapour mixture going into the lamp varied. If the temperature was low, and the photometer-room had a temperature of somewhere about 55° or 60° Fahr., the mixture would contain more or less air in excess, because the evaporation was not rapid; and this fact would affect the candle power. With regard to hygrometers, the only thing he could find to agree with the Assman hygrometer was a determination of the humidity in the air by the use of solid glacial phosphoric acid. The only appliances corresponding to, or at all in harmony with, the Assman hygrometer, were the swinging bulbs—dry and wet bulb thermometers swinging on a handle. If the thermometer were put on a handle and swung at a certain speed, the results corresponded almost exactly with those of the Assmann hygrometer.

Mr. C. O. BOND said he was wondering whether the change that might be made by applying the authors' formula of corrections for water vapour, instead of the one used by Mr. Paterson, at the National Physical Laboratory in England, would give rise with the English people to any question as to holding back the new international unit, which was thought to be practically agreed upon. It would be a most regrettable thing if the entire subject of the international candle should be opened again.

Mr. CRITTENDEN, replying upon the discussion, said, in regard to the content of water in the air, it was to be noted that the number of litres given in the paper was the number per cubic metre of dry air; and therefore not exactly the same quantity would be used in the chemical determination as was ordinarily given. The statement that the pentane lamp and other lamps of larger illuminating power varied more nearly in proportion with the gas-flame of 20-candle power, was not valid, he believed, because the variation was a matter of percentage. It was interesting to note that, according to the results reported in the paper, the percentage of variation in the flame standard was practically the same for the Hefner as for the pentane standard—in fact, the constants had come out to be 0·56 per cent. for the Hefner, and 0·567 per cent., in round numbers, for the pentane. In other words, the two standards had operated the same way, which incidentally rendered reasonable the assumption ordinarily made that the gas-flame varied in proportion with the standard itself, and in this way strengthened the use of this standard for the testing of gas. He might mention that in some work on other flame standards of various kinds, he and his colleague had found a similar variation—a factor of 0·55 per cent., or practically the same value. Therefore the assumption ordinarily made, that all flames varied in practically the same way, seemed to be borne out by these constants. With regard to the effect of atmospheric and barometric changes on the Hefner standard as operated at 45 mm. instead of 40 mm., they had made some determinations, though their measurements had been more limited in number; and the coefficients found were practically equal. The number of observations had been relatively small, but the variation factor there had been 0·53 per cent., as compared with 0·56 per cent. at 40 mm. In other words, there was only a variation which might well be due to experimental error. For barometric variations, they had not made any determinations on the 45 mm. height. Liebenthal's value for the barometric correction factor for the Hefner lamp was given as 0·00011; and the mean of the authors' values on the six lamps had come out as 0·00014, which they considered as a very close agreement. This value was for the 40 mm. instead of the 45 mm. height. There seemed to be no reason for believing, however, that the variation should be greatly different in the case of the latter height. As to the question of the centre of radiation, they had in each case followed the practice which they believed well established in the laboratories in which the lamp was used, and had taken the geometric centre of the flame as the centre of radiation. It did not, however, matter what was taken for the centre, so long as all agreed. He and his colleague had had little experience with the Carcel lamp, and they agreed with most of those who had tried to use it, that it was unsatisfactory. The variations from the mean were probably 2 per cent. on the average, compared with less than 0·5 per cent. in the case of the pentane lamp. Therefore, they had not considered the Carcel lamp seriously. It had been well established that the nature of the wick material in the Hefner lamp was not essential. It might be a loose string, a woven wick, or anything else that would draw the fuel up to the top of the tube, where it would be evaporated. As the wick was not burnt, it served merely as a conductor to bring the fuel up to the hot part of the tube. In operation, the wick was from 1 mm. to 3 mm. below the top of the tube, where it served as a capillary conductor, and not as a burning material at all. On starting, they were quite discouraged with the pentane lamp, and were ready at times to throw it aside; but they had rather reversed their opinion. They were now glad to work with this lamp and get away from the Hefner; so that their statement was not meant to imply that the latter was preferable to the former. As to the fuel and the danger of using it, it was true that the evaporation of pentane and its escape into the air through the air-inlet had an element of danger. In one instance at least, when operating in hot weather, the pentane caught fire at the top of the lamp. But it was checked by simply turning off the stopcock, and no explosion resulted—in fact, they had grown rather careless in handling the lamp, because they had used it under all sorts of conditions without accident. Still, there was the possibility of an explosion, which was not present in the case of the Hefner lamp. Concerning the time of lighting, they found ordinarily that with the English lamp 15 minutes was long enough for the candle power to reach its steady value. In the case of the American lamp, the time required was half-an-hour, or sometimes slightly more, after which

the values were very steady. The difference was probably due to the greater amount of material which had to be heated in the American lamp; and therefore a longer time was required to reach a state of equilibrium. As to the Assmann hygrometers, they had been found very reliable. Readings on two different instruments would agree usually within 0·1 degree, and seldom differed by more than 0·1 degree.

The PRESIDENT (Dr. E. P. Hyde) inquired as to whether any evidence had been found of a temperature effect due to the temperature of the room. He said there were one or two reasons why this was not inconceivable. In the first place, the flow depended to some extent upon the temperature relations in the lamp itself; and, secondly, the composition of the gas in the pentane lamp varied greatly with the temperature. At high temperature, pure pentane was obtained through the burner; and at comparatively low temperature, a considerable quantity of air was mixed with the pentane.

Dr. ROSA, in reply to the question as to humidity in the air, said he and his colleague should prefer to express the humidity as so many litres per cubic metre of the atmosphere, as was usually done; but in this particular matter they had followed the practice of Germany and England, and expressed the number of litres of water vapour per cubic metre of dry air, rather than of the atmosphere itself. As to the question of the centre of radiation, in addition to what Mr. Crittenden had said, he (Dr. Rosa) would suggest that in a primary standard it would be an advantage if the distance at which the flame was measured were specified. For example, if the centre of the flame was 1 metre from the photometer-screen, and was always measured at one metre, any uncertainty due to slight variation of the centre of radiation from the axis would be eliminated. In a primary standard, in order to fix the unit of light, all possible chance of variation ought to be eliminated; and he thought that to specify the distance would not be any hardship, and would ensure that the measurements were made under more nearly uniform conditions. Dr. Elliott's statement about pentane should be qualified. It was not quite so definite as it should be; but it was not very different if it was prepared according to closer specifications than was done now. Pentane that passed the specifications was distilled between temperatures of 25° and 40°. This was a pretty wide range. There were at present three forms of pentane; and if there were specified only one, with just a little of either of the other two, instead of allowing three, the results would be satisfactory, because, as a matter of fact, there was very little difference in the light-giving value of the three. As to whether this would have any effect upon the value of the international candle, he could not say. It would be for the National Physical Laboratory to work this out. It was evident to his colleague and himself from their work that, before the pentane lamp could be considered a satisfactory primary standard, its specifications must be very much improved and made closer; and this would require international action, or at least ought to receive international consideration. There were at least four different things in which they in America should confer with other countries. One was in regard to the unit of light. They had what they called, or proposed to call, the international unit of light used by three countries. If this unit could be extended to the whole world, great advantages would result; but in order to do it, international consideration was required. There was also the question of the specifications of the two flame standards. If they should be altered in America, the change would perhaps not be accepted abroad. But, in order that it might be, and become general, international consideration must be given to the question of a primary standard; and either the pentane or the Hefner would, it would seem, under better specifications, be a fairly good one. There were also subject to international considerations the methods of measurement—*i.e.*, the matter of passing from one colour to another in heterochromatic photometry, as well as the nomenclature question. Instead of there being only the one question of nomenclature, there were four. He should like to suggest that at the proper time there should be appointed by the Society a Special Committee to consider the most feasible way of bringing about international agreement and uniformity on the questions to which he had referred.

Separating Carbonic Acid from Gaseous Mixtures.—A patent has been taken out for France by MM. E. A & J. G. Behrens for a process for separating carbonic acid from gaseous mixtures containing it. According to an abstract of the specification contained in the "Journal of the Society of Chemical Industry," it consists in subjecting the highly compressed mixture to a low temperature, so as to liquefy part of the carbon dioxide, and bringing the remaining gas into contact with a liquid, such as alcohol, which absorbs the residual CO_2, which is then separated from the solvent by reduction of pressure and returned to the compressor to enrich the mixture. In the apparatus described, the compressed gas passes down a coil surrounded by alcohol at −65°C.; and the carbon dioxide thus liquefied is removed, The remaining gas, still under pressure, is then made to travel upwards, in a spiral path, through a cylinder, in which it meets a descending stream of cold alcohol. The gas is next freed from suspended particles of alcohol by means of baffle-plates, and is allowed to expand in a turbine, which helps to drive the compressor; the very cold expanded gas being utilized subsequently in cooling the alcohol. The refrigerating and the absorbing alcohol each follow a closed circuit.

VERTICAL RETORTS AT BURNLEY.

The Woodall-Duckham System.

We are able to publish the following report by Mr. J. P. Leather, the Gas Engineer at Burnley, to his Committee, on the subject of the Woodall-Duckham vertical retorts erected there. When using Burnley coal, there has been carbonized as much as 55·7 cwt. of coal per retort in 24 hours; and it is estimated that the production of gas was considerably over 12,000 cubic feet per ton. As the guarantees in the contract were 12,000 cubic feet per ton when carbonizing 52 cwt. of coal per day, Mr. Leather considers that the contractors have fulfilled their obligations, and that therefore the retention-money should be paid to them.

I have pleasure in submitting a report on the working of the vertical retorts.

The first gas was made in the new installation on the 2nd of February, 1910; but the whole of the retorts did not get to work until the 19th of March. We are not able to state accurately how much gas is made in these retorts when gas is being made in the inclined-retort house at the same time, as the whole of the gas has to pass through the same purifiers before being measured. It was my expectation, however, that during the summer months sufficient gas would be made in the vertical retorts to keep up the supply to the town with the aid of a small admixture of carburetted water gas. Accordingly, on the 24th of May the inclined-retort house was stopped; and until the 6th of September we relied on the vertical retorts for coal gas. Unfortunately, many difficulties were experienced, a number of which were due to defects in the mechanical arrangements, which had to be made good by the patentees and contractors. Much time was occupied in doing this. The various breakdowns and stoppages necessitated the use of an average of 50 per cent. of carburetted water gas to maintain the supply to the town.

With the approach of autumn, it became necessary to work inclined retorts again. The alterations in the mechanical drives, &c., resulted in better working; but it became evident that the rough treatment the retorts had received in the endeavour to force work out of them, rendered it necessary to stop some portion for repairs. Accordingly, five settings out of the nine were put out of action; and we have now only four settings (*i.e.*, sixteen retorts) at work. During the whole of the summer, the patentees kept a staff of men here with a view to instructing our men in the working and obtaining the guaranteed results from the retorts.

I very early formed the opinion that our men would produce better results in the absence of the patentees' staff. It would, however, have been a serious responsibility to have sent them away, as I was afraid lest in so doing I should at all jeopardize the interests of the Corporation. When, however, the mechanical arrangements had been put in proper order, the patentees agreed that we should work the plant without their assistance; it being understood that the retention-money remained unpaid until we were satisfied with their performance of the contract. This policy has now been justified. For two months the working of the retorts has steadily improved, in spite of the fact that three or four of them are in bad condition, and will not be quite right until we are able to stop them for repairs. Part of this improvement is due to slight alterations we have made, which as yet are only applied to a portion of the retorts.

The patentees thought that our difficulties were in a large measure due to the Burnley coal, to which they were unaccustomed. This, however, is not the case. During one week this month, we used Ackton Hall washed nuts—a quality named by them as suitable. From the 17th to the 20th of November, the whole of the coke was carefully weighed; and it was found that the average weight of coal per retort per day was 50 cwt. This was less than I had estimated the previous week as the consumption of Burnley coal. On the 25th inst. [December], when Burnley coal was again being used, a careful weighing was instituted for 24 hours of the coke from four retorts. The result is that we carbonized in these retorts 55·7 cwt. of coal per retort.

While exact figures of the make of gas cannot be given, owing to the inclined retorts being at work at the same time, a careful comparison of the figures from day to day makes it probable that over 12,000 cubic feet of gas per ton are obtained from Burnley coal. The guarantees in the contract are 12,000 cubic feet per ton, when carbonizing 52 cwt. of coal per day. I have no doubt now that this can be done easily with Burnley coal. During the summer, the average make per ton was 10,630 cubic feet, which is greater than our usual make, in spite of the fact that enormous quantities of gas were wasted owing to the inefficient working of the plant. This leakage of gas rendered the conditions under which the men had to work almost unbearable, and was a source of pecuniary loss, as the gas ought to have been measured and sold. This loss of gas has already been greatly minimized. When the improvements are extended to the whole of the retorts, and the retorts now at work undergo the usual annual repairs, there is little doubt that the evil consequent on leakage can be avoided, and the aim with which the retorts were installed will be attained. Under these circumstances, I think it would be wise to pay the retention-money to the contractors, and take over entirely the working of the retorts.

While reporting on the vertical retorts, it may be convenient at the same time to make a statement as to capital expenditure

on the new gas manufacturing plant. The figures presented to the Local Government Board showed an estimated expenditure of £20,014. The amount sanctioned for borrowing powers was £17,074, leaving £2940 to be taken from revenue or reserve fund. The expenditure to date has been as follows:—

Exhausters	£514 0 0
Retort-house and coal-store	7,163 9 10
Coal-handling plant	2,231 10 0
Vertical-retort bench	10,861 5 3
Total	£20,870 5 1

A deduction has yet to be made for scrap metal, &c., from the dismantling of the old horizontal retort-house, which may amount to £150; and an additional sum has yet to be expended on tar-extractors, for which £660 was provided in the original estimate.

As I have already stated, the sanction of the Local Government Board provided for £2940 being taken from revenue or reserve fund. I suggest that the whole excess, of approximately £4250, be taken from reserve fund.

(Signed) JNO. P. LEATHER, F.C.S.,
Dec. 1, 1910. Gas Engineer.

RADIATION ERRORS IN FLOW CALORIMETERS.

The members of the London Section of the Society of Chemical Industry, meeting at Burlington House yesterday week, had their attention called by Messrs. J. H. COSTE and B. R. JAMES to the above subject. The full text of the paper will appear, in due course, in the "Journal" of the Society.

Briefly stated, the points advanced by the authors in their short paper are these: The tacit assumption usually made that losses or gains due to heat exchanges between a gas calorimeter of the flow type and its surroundings are negligible, is correct only when the temperature of the water supply approximates closely to that of the surroundings. If this is not the case, it will be found that, when water is allowed to circulate through the instrument without lighting the gas, the temperature of the outlet water will be different from that of the inlet. If the water supply, as is usual, is of a lower temperature than the surroundings of the calorimeter, heat will be absorbed by the latter, and the outlet thermometer will record a higher temperature than the inlet thermometer. Examples exhibiting this were given. It is shown that the changes were due to radiation rather than to convection.

The error due to absorption or radiation of heat could conceivably be corrected in three ways:

(1) By considering the thermometer readings when water is flowing at the desired rate, but no gas is burning, as index or zero errors, and using the observed increased difference between inlet and outlet.

(2) By raising the water to the temperature of the room. This may be done by having a water-tank in the room, or by passing the water through coils of piping heated either by gas or by chemical action.

(3) By surrounding the instrument with an annular metal vessel (separated from it by an air space), through which water circulates before reaching the inlet thermometer. This method has the special advantage that it places the calorimeter in a position where it is not affected by fluctuations of external temperature. This is important when a suitable room of constant temperature and free from draughts is not available.

The fact that flow calorimeters do not present a homogeneous temperature system, renders the computation of errors due to radiation most difficult, so that a reduction of them is the most practical method of minimizing their effect.

The results obtained under ordinary winter conditions, and by the methods indicated, are compared. The uncorrected results are in each case higher than those in which the temperature of surroundings of the calorimeter and the inlet water have been made to approximate closely. The average difference is about 1 calorie. In summer this would be less. A Boys calorimeter was used for the experiments.

The authors concur with the advice of the Committee of the American Gas Institute that attention should be paid, in all accurate work, to the reduction of errors of the kind indicated. The correction of $\pm \frac{1}{6}$ the difference of temperature of the inlet and outlet air used in official testing appears to correct fairly well errors due to other causes than radiation. The general tendency is for results so corrected to be above the truth. This is not, from a testing point of view, of great importance, since any standards based on such testing would be equally affected by such errors. It is, however, desirable to put on record both the nature and the amount of the errors due to radiation, and the above simple means of reducing them.

There was really no discussion on the paper, the time for the meeting having been exhausted by the preceding papers. But Mr. Huntly made one or two criticisms, the tenour of which can be gathered from the remarks of Mr. Coste and Mr. James.

Mr. Coste said he did not think the effect on the outer surface of the calorimeter of heat in the centre was very great in any standard pattern of calorimeter. But if one was working with cold water in a warm room, heat was registered with which one had no right to credit the gas. If, however, the temperature of the water was raised to that of the room, or the temperature of the room was cooled to that of the water by putting a water-jacket as suggested in the paper round the calorimeter, more accurate results could be obtained. The right plan was to raise the water to the room temperature, and then surround the calorimeter with a fairly large mass of the water, in order that radiation from the body might not influence the result.

Mr. James remarked that Mr. Huntly had pointed out the difficulty of accounting for or estimating the amount of heat lost by radiation. Their object all along had been to minimize the radiation rather than determine the amount of it.

TESTING INCANDESCENT GAS-MANTLES.

A Definite Specification Required.

At the Meeting of the London Section of the Society of Chemical Industry yesterday week, Messrs. J. H. COSTE and W. E. F. POWNEY presented a short paper on the above-named subject. The lines of the paper (which was read by the second author) are merely indicated here, in view of prior publication of the full text being reserved for the Society's own journal.

In the first place, the authors point to what is undoubtedly a fact, that little information as to the comparative testing of mantles appears to be available. They acknowledge the work of the Photometry Committee of the German Association of Gas and Water Engineers, who recommended a consumption of gas varying between 4 and 4·6 cubic feet of gas per hour at a pressure of 1·4 to 1·6 inches of water. In the tests of the Committee, it seems probable that reference was only made to "C" burners. The air supply appears to have been fixed; and the consumption of gas adjusted until the highest illumination from the mantles was obtained. The durability of the mantles was judged after a number of hours' burning; and at least four mantles had to be tested. This method would, the authors gathered, have required thirteen days for a single test, and would also have necessitated a large installation of burners.

The authors have been seeking a more simplified system for the examination of incandescent mantles, based on the elimination of those which are of defective strength. This necessitates first durability tests. Various appliances have been devised for subjecting mantles to a series of mechanical shocks. They found the Metropolitan Gas Companies were using an apparatus which appeared to be suitable. This is the Woodall-Moon machine, which administers a series of equal shocks at equal intervals. Construction and operation were described; and the authors state that this machine appears to give vibrations such as occur in heavy traffic, and when persons are moving about in a room overhead. In the authors' opinion, it is necessary to apply a durability test of this kind before burning the mantles for any long period. In their method, after being burnt off and hardened by five minutes' burning, upright mantles are always expected to stand 1000 shocks, and inverted mantles 3000 shocks. Then from a batch of twelve mantles, three are tested for durability; and if any of the three fail to stand 1000 shocks (upright) or 3000 shocks (inverted), then three more are tested. If the average strength of the six is represented by a figure less than 1000 for the upright and 3000 for the inverted, no further tests with this batch are made. By testing only up to 1200 and 3600 shocks respectively, one unusually strong mantle is not allowed to compensate for abnormally weak ones; but the test allows one mantle in six to fail absolutely, if the other five survive. This is the method adopted by the authors in weeding out good makes of mantles from bad ones in regard to strength. The authors appear to have found (what users find) that there are high quality mantles, and others little more than rubbish. On some occasions, they have had samples which gave figures much below 100 as an average of six mantles from a single batch, while single mantles have broken down after three or four shocks. However, the mantles that pass the durability test are then tested photometrically.

For this purpose, Bray's burners with air adjustment are used. After the mantles are properly burnt off, three are burned for 100 hours on their proper burners, and are then removed to the photometer. The ten-candle Harcourt pentane lamp is used as the standard of light; and the Leeson star disc (modified by Dibdin) has been found to be satisfactory for the purpose of comparison. Parenthetically, the authors mention that the secondary incandescent standard as devised by Carpenter and Helps is considered by them as satisfactory; but they see no reason for abandoning the use of the pentane lamp. The gas used in the tests in London has a fairly constant calorific power—120 to 125 calories per cubic foot. The consumptions and pressures at which six mantles were tested in the experiments made by the authors were as follows: "C" burner, gas consumption 3½ cubic feet; pressure, 1·2 inches. No. 1 Kern burner, gas consumption 2 cubic feet; pressure 1·8 inches. Kern No. 2 burner, gas consumption 3 cubic feet; pressure 1·4 inches. Kern No. 3 burner, gas consumption 4 cubic feet; pressure 1·6 inches. Kern No. 4 burner, gas consumption 5½ cubic feet; pressure 2·1 inches. Inverted burner (large size), gas consumption 4 cubic feet; pressure 2·3 inches. In the case of the upright mantles, the horizontal value was taken on a 60-inch Letheby bar photometer; and the average of the values at 0°, 45°, and 90° with the horizon for the inverted mantles. The

authors have adopted a formula for calculating the mean error of a number of observations; but this and the tabulated results of the investigations (which were thrown on a screen) must await publication in the Society's journal before they can be reproduced in our columns.

After the photometrical testing, as described above, the authors suggest that a final selection can be made either by disregarding all with an average illuminating power below a certain amount, and then striking out all with an excessive variation between individuals, or by subtracting from the average illuminating power the mean variation, and using the result as a figure of merit. Price will naturally act as the final determining factor.

It was seen from the tables thrown on the screen that the duty obtained per cubic foot of gas consumed from various mantles of the same size did not vary greatly. As an example, a few of the efficiencies per cubic foot from a number of upright "C" mantles may be quoted in the sequence shown on the screen: 18·2 candles, 17 candles, 16·7 candles, 18·9 candles, 18·4 candles, 17·3 candles, 16·4 candles, 16·6 candles.

Discussion.

The Chairman (Mr. E. Grant Hooper), in the course of his remarks, pointed out that users of mantles were not accustomed to buy them with any guarantee as to efficiency or durability attached. But the paper indicated that certain bodies and individuals were on the look-out for the actual merits of the productions of mantle manufacturers; and it would consequently be more and more necessary for the latter to see that their products came up to a certain standard.

Mr. W. J. Dibdin said he had had some experience of the testing of incandescent mantles; and he was bound to come to the conclusion that there was no proper test for them. From his subsequent remarks, he appeared to have had some bad experience in times past from the fragility of mantles. However, he felt glad that Mr. Coste and his colleague had been able to put something definite before the members; his own experience having been that, of all the indefinite pieces of work that anybody could be called upon to do, was to give a fair, honest, unbiassed opinion as to the value of a gas-mantle. In his experience, he had found mantles that would give 70 or 80 candles—a lovely, beautiful light; then after a time, it would go down to perhaps 30 candles or less. If a mantle could be subject to a series of vibrations, they could produce a sort of revivification. This was due no doubt to the breaking away of some of the oxides formed on the surface of the mantle; and it would then again give a much better light. He did not follow that the authors dealt with this point in the paper; but it would be a valuable test for them to make—to show how many times a mantle could be revived, and brought back to its illuminating quality.

Mr. C. S. Garland asked whether the authors had made any experiments regarding the speed of the shocking of the mantles. It was believed by some that if the period of the blows was the same as the period of relaxation of the mantle, the mantle would break away quicker than if the periods were vastly different. Then on the subject of the necessity for experiments, he (speaking for one of the manufacturers of mantles) could assure the authors that the thirteen days' tests were carried through on every batch of mantles they sent out. He had not found the Woodall-Moon machine to be altogether satisfactory, because batches of mantles that had passed the test satisfactorily on the machine had failed on the burners; they had fallen before the thirteen days' tests were up. Other batches of mantles that had not passed the test had gone on constantly and smilingly through a twenty or thirty days' test on the burners. He quite agreed that a good test for incandescent mantles had yet to be brought forward; and, in his opinion, twenty to thirty mantles should be used to get a good mean value.

The Chairman asked whether the authors had made any observations with reference to the effect of the actual burning upon the mantles. Mr. Dibdin had suggested that with vibration there seemed to be some sort of revivification of the mantle. He (the Chairman) should like to suggest whether there was not rather some effect upon the burner than the mantle. It was certainly a striking fact that, when a mantle ran down, if the burner was cleaned, an astonishing difference was made to the light. It had occurred to him that it was quite possible certain mantles might more rapidly choke the burners than others, and that, in such instances, there might be more rapid running-down of the illuminating power than in others.

Dr. Keane asked whether the authors found that six mantles of similar character or class gave fairly uniform results. One of the striking things about the tables thrown on the screen was the closeness of the illumination duties. They seemed to indicate that, where mantles of the same type were of similar character in regard to durability, they were similar in respect of their illuminating duty. In making tests, the preliminary durability trial had to be followed by illumination tests which were extremely difficult to carry out in practice; and if to start with some reliable indication could be given as to mantles being of similar quality, it would be of public use as giving people some guidance when purchasing mantles. With regard to the shock tests, the mantles appeared to be subject to a vertical motion; but in practice they also received horizontal motions. He should look forward with interest to some further information from the continued pursuit of these investigations.

Mr. Coste said he was in the position of an analytical chemist who had to do the best he could with the appliances that were at hand. He agreed as to the somewhat unsatisfactory nature of any tests yet applied to incandescent mantles. They had had the views of different makers regarding their tests. The Woodall-Moon machine was recommended to them by the largest of all gas companies. But one very big firm of mantle makers thought the test was too drastic; while another prominent firm told them that the machine did not test the mantles sufficiently thoroughly. They thought a more violent machine was necessary. Of course, either might have been right; and both might have been wrong. People, however, had to do their best, and take what appeared to be the happy medium. The mantles tested photometrically had not been subjected to shock, though others of the same batches had been. But they had been burning 100 hours before they were tested for illumination results. They originally tested after burning the mantles for five hours, and then after 100 hours, but saw no reason for continuing the five-hour tests. It must be remembered he and Mr. Powney were not carrying out a research where time was of no importance. They were simply trying to determine upon practical tests which would help in making a choice of mantles. They were not professional revivifiers of mantles. He did not think the makers would wish them to be. He had, however, observed that, if a mantle was taken off a burner with a piece of wire, and dipped in cold water while it was hot, and then put on a burner again, it would often freshen it up. A good mantle would stand this; and it was most unusual for a mantle to break under these conditions. The Chairman had hit upon a point when he referred to burners requiring attention. With regard to Mr. Garland's remarks as to the shock tests, they had adopted the rate of 300 shocks per minute; but they had not made much investigation on the point. One could quite understand that makers who were desirous of keeping up the quality of their products to a good standard would make more elaborate tests than people who had to make rapid comparisons of many large batches. The results that had just been shown were all for "C" mantles. Most people who used upright burners employed "C" mantles; and it seemed to him that makers had concentrated their attention on this type and had been more successful with them than with others. He thought that to this was due the considerable uniformity that was noted. In conclusion, he repeated that the testing of mantles was not on a very satisfactory basis at present. But it was no use to say a thing was unsatisfactory, and leave it in this way. One must try his utmost to put it on a better footing.

Hypochlorite Solution for Water Filtration.

The principal paper read at the meeting of the New England Water-Works Association held last month in Boston (Mass.) was on the subject of the mechanical filtration plant erected at Newport (R.I.), in which provision is made to sterilize the water by hypochlorite solution before or after filtration. The plant consists of two settling-basins arranged to operate as one under normal conditions, a distinct coagulating-basin through which the settled water must pass to the filters (six 1-million gallon filters), and a clear-water well below them. The settling-basins are arranged around three sides of the coagulating-basin; and they all occupy a space about 135 ft. by 70 ft.—the coagulating space being 84 ft. by 25 ft. The settling-basins are 19 feet deep, and the coagulating-basin is 16 ft. in depth. Preliminary operation of the plant showed that the introduction of the hypochlorite solution had no apparent effect, even when quantities large enough to convey a distinct odour of chlorine to the filtered water were used. When coagulation with sulphate of alumina was effected as the water entered the settling-basin, and the coagulater water was filtered in the usual manner—the hypochlorite solution being fed in minute quantities at the point in the clear-water well at the sump or high-service suction—the desired result was attained; and practically sterile water, clear and bright, was sent out to the consumers. Last November, one grain of sulphate of alumina per gallon was fed to the discharge of the low-service centrifugal pumps; 0·5 part per million of hypochlorite of lime being applied at the sump or outlet of the clear-water well.

Official Changes in the Salford Corporation Gas Department.—Consequent upon the death of Mr. F. R. Hartley, the Deputy-Engineer in the Gas Department of the Salford Corporation, as recorded in the "Journal" for the 13th ult., Mr. H. Shaw, the Superintendent of three of the works, has been promoted to the position of Chief Superintendent of Works and Plant. Mr. C. E. Teasdale, the Chief Draughtsman, is to be Assistant Constructional Engineer; and Mr. F. H. Goodwin, Engineering Assistant, succeeds Mr. Teasdale as Chief Draughtsman. In connection with these changes, there has been a revision of salaries on a considerable scale.

Railway Rebates from Private Sidings Traffic.—We have received from Messrs. H. O. & J. Hutchinson, of Lancelot's Hey, Liverpool, a little book on this subject written by Mr. Harold Osborne. The author was formerly a rates clerk in the service of one of the principal railway companies; and the object of his book is to place before the public, in brief and concise form, the position of the rebates question in regard to differently situated sidings, and to set out the sums which have been determined as the due allowances on various descriptions of traffic. At the end of the book will be found examples of exceptional rates from which rebates are granted. The price of the work is 3s. 6d. net.

PARSY'S IMPROVED RETORT-SETTING.

A patent has been taken out for France by M. Paul Parsy for an improved setting of retorts. It is shown in the accompanying illustrations; fig. 1 being a half elevation and longitudinal section; fig. 2, a plan; fig. 3, two transverse half sections on the lines X and Y of fig. 1; fig. 4, a vertical section of the centre producer; and fig. 5, a similar view, but with the addition of devices to ensure greater efficiency.

The setting consists of a centre producer A, on each side of which there are vertical carbonizing chambers B arranged in two rows, back to back. They are separated by independent heating chambers C, each fed with mixed gas from longitudinal distributing flues D. Combustion of the gas at the nostrils E, near the front wall of the setting, and consequently easy to inspect and regulate, is effected by air coming from neighbouring orifices F, which are in direct communication with the regenerators G, through which the chimney gases are drawn off to the main flue H. The hot gases circulate at the higher part of the setting, as shown by the arrows in fig. 3.

Each carbonizing chamber ends in a lid or mouthpiece I, through which it is filled. The chambers, which have sloping bottoms, are emptied by opening the side doors J, which are kept pressed against the side of the setting by spring wedges and movable cross-pieces adjustable to armatures. Tight closing may be ensured with or without luting. To reach the hydraulic main by way of the ascension-pipe, the gas passes through the opening K (fig. 3), situated about half-way up the chamber. This shortens the passage of the gas, and facilitates its upward flow with very little pressure. The producer is placed in the centre of the setting, which it serves from two mixed gas intakes L, governed by the dampers M. This arrangement allows of half the setting being isolated and work stopped. As each chamber is fired independently, it also can be worked separately. By taking off the gas at a point midway in the depth of the chamber, it is possible to produce water gas by causing water to fall in drops from the upper part during the last hours of the carbonization period, the length of which is regulated by the width of the chamber. This is such that for a 24-hour period the temperature of the chamber is not so high as is usual in ordinary retort-settings.

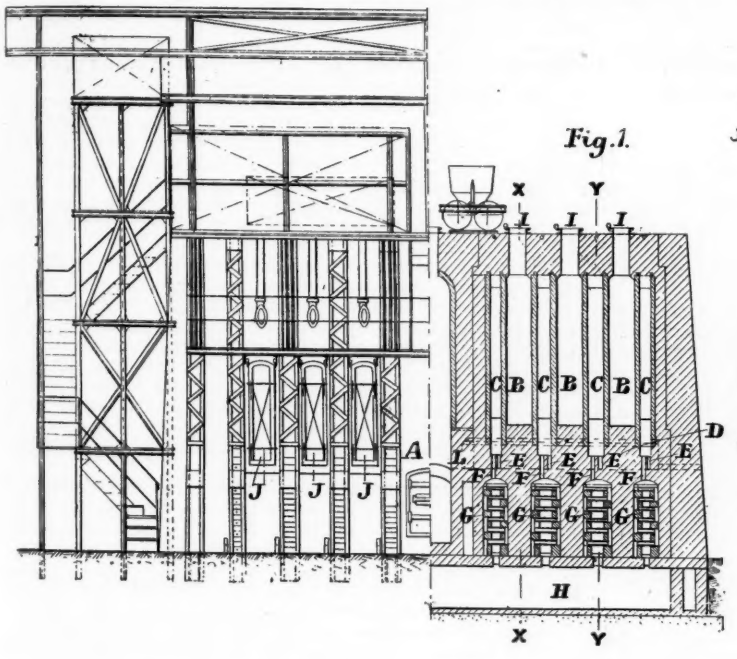


Fig. 1.

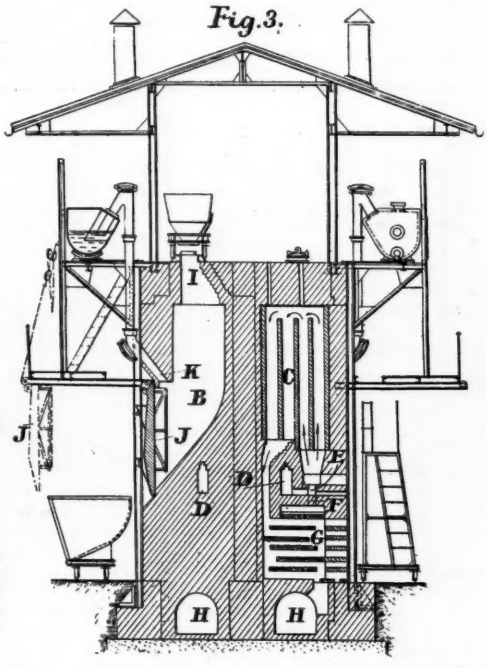


Fig. 3.

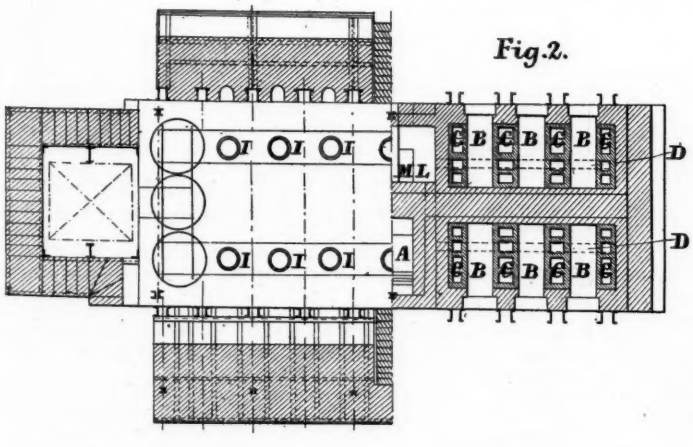


Fig. 2.

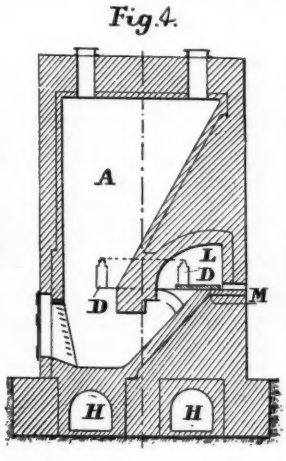


Fig. 4.

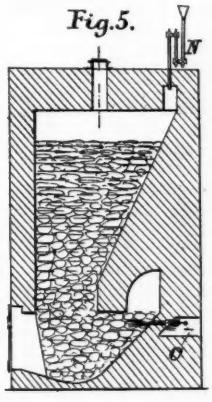


Fig. 5.

The characteristic feature of the vertical carbonizing chamber is the method of filling it. The coal is charged through a horizontal opening in the upper part, whereas the coke is removed through a vertical side opening at the base. In order that the operation of emptying may be performed satisfactorily, the shape of the chamber must be such that the mass of coke can be taken out without having to be first of all broken up. The chamber widens towards the bottom; and this facilitates emptying. In the form shown in figs. 1 and 3, the shutting of the side opening is effected by means of a door which moves horizontally. It is provided with a screen, so as to keep at a distance the coal in process of carbonization, prevent cooling, and thus avoid the production of undistilled coal at this place.

The producer shown in figs. 1 and 4 is intended to be charged with coke; whereas the one shown in fig. 5 is constructed to take simultaneously both coke and tar. The latter, however, instead of being burnt in the producer, is merely gasified, so as to enrich, by carburetting it, the poor or the mixed gas produced by the combustion of the coke. For this purpose, the tar is introduced through the syphon N, which, as will be noticed, is placed at a part of the chamber where the temperature is relatively low, or by the nozzle O, which is in a portion of the chamber where the temperature is high. The tar is thrown in a jet on to the red-hot coke, where it is gasified without being burnt. In this way the tar made in the setting can be utilized in the producer, and an equivalent quantity of coke saved. At the same time the combustion temperature of the gases in the producer is increased, and the heating of the setting thereby facilitated.

As already mentioned, water gas can be produced during the final hours of the carbonizing process. Rich gas can also be made by introducing petroleum, schist, or other oils in drops in the same way as the water. This rich gas carburets the coal gas mixed with water gas, and increases its lighting and calorific power.

THE PRESENT POSITION OF THE COAL-TAR INDUSTRY.

By Ernest F. Hooper.

Before the Newcastle Section of the Society of Chemical Industry, on Nov. 22, Mr. Ernest F. Hooper read a paper bearing the above title; and it is here reproduced from the last issue of the Society's "Journal."

He pointed out that, owing to the brilliant chemical researches conducted mainly during the last sixty years resulting in the discovery of vast numbers of dyes and other products, one might be led hastily to assume that the majority of tar products have commercial usefulness in this direction. The fallacy of this contention was shown by the following analysis of a typical tar:—

	Per Cent. by Weight.	
Water (ammoniacal) .	3·00	
Naphtha light oil . .	3·10	Yields 1·0 per cent. benzol.
Middle oil	7·68	,, 1·5 per cent. toluol and solvent.
Creosote oil	10·15	,, 8·12 per cent. naphthalene.
Anthracene oil . . .	11·64	,, 0·3 per cent. anthracene.
Pitch	61·00	
Loss	3·43	

From these figures, crediting naphthalene with as much as 1 per cent. as used for colour-producing purposes, and assuming one-half the benzol and toluol goes for aniline and toluidine dye purposes, it appears (he says) that roughly 2 per cent. of tar products find their way into colour manufacturers' hands. From his own observation, he is inclined to think that even this is an outside figure.

He proceeds: It is also necessary to note that, unlike most other chemical products, and especially those of a natural character of well-known types, the supply of coal tar is, in every country where produced, limited in its quantity. A heavy demand on a certain constituent will, under ordinary circumstances, enhance the value of this product, and the supply of such material is strictly within a very elastic limit. To illustrate this fact, I need only refer to the remarkable synthesis of artificial indigo from toluene some years ago. After years of patient and unremitting work, it was found impracticable commercially to produce indigo by this means, owing to the fact that to produce indigo on a commercial scale would force the price of the limited supply of toluene to practically famine prices; and were such supplies, even at a price, obtainable, the quantity available would be far too small to successfully build up a trade in competition with the natural product.

On the other hand, a supply of any product exceeding the normal demand is almost necessarily followed by a rapid drop in the value of such a product, as with few exceptions the separation of the constituents must proceed consecutively one with another. To this may, I think, be largely attributed the enormous fluctuations in the value of tar products, unequalled in short spaces of time by almost any other series of chemical manufactures.

Dr. Beilby, in his presidential address at Newcastle-upon-Tyne in 1899,* speaking of the excessive quantity of tar available if coal gas were extensively used and bye-product coke-ovens were widely erected, warned us as to the fact that no possible demand for dyes, narcotics, or febrifuges, or other hydrocarbon products could possibly absorb the increment of material produced already from the above sources. The table I have just alluded to confirms this point. He directed the attention of engineers and scientific men to the utilization of tar as a fuel of high calorific value. Since that period, however, events have occurred which have largely neutralized the danger of excessive over-production of coal tar.

First, the production of tar has increased by no means proportionally to the production of coal gas at gas-works, and the annual increment of the rate of tar production by gas-works has not been so great as in past years—one reason being that, owing to the change of burners from flat-flame to incandescent mantle burners, in many cases lower candle power gas is made, equivalent to a larger number of cubic feet of gas per ton of coal carbonized; and another being that, consecutively with the much greater illuminating power per burner, much less gas per burner is required. This argument is not materially affected by the fact that more lighting, and of a better quality, is, and probably ever will be, the demand of the public.

Moreover, during the last decade, it must be borne in mind that many gas-works, rather than extend their plant, as regards retorting power, including naturally condensers, scrubbers, purifiers, and such necessary adjuncts to larger retort output, have resorted to the aid of a carburetted water gas, or other than coal-gas type plant, which gives the gas required under special heavy load conditions, such as heavy fog or frost, but little tar. This applies to small gas-works as well as those of a larger capacity.

A few words may now not be out of place as to the crude products dealt with. During the last twenty years, many changes have come over the industry as a whole. Coal tar two decades ago consisted almost entirely of tar produced from the destructive distillation of coal in the retorts of gas-works. The quality of this tar varied, mainly owing to the quality of the coal used in the process and the temperature of the fire-clay retorts. This comparatively simple factor does not by any means cover the present position. Owing to the much higher temperature of carbonization, due no doubt to the ability of the executive staff of the gas companies in extracting the utmost calorific and illuminating value from the coal, gas-works tar has a much higher free carbon or (more correctly, as we shall see later) coke dust content than formerly, to the material loss of the normal hydrocarbons and other products. Again, especially in the Midlands and the North of England, a great number of bye-product coke-ovens have been erected of late years, yielding large quantities of tar differing very materially from that produced from gas-retorts, owing, naturally, to the different method of carbonization.

The general tendency has been for the gas-works to produce a relatively smaller percentage of tar year by year to gas made. The loss, however, has been more than made up by the tar produced from the bye-product coke-ovens. A considerable quantity of tar—some 200,000 tons per annum—is also produced by condensation from the waste gases of blast-furnaces. The products from this source, as will be indicated presently, differ materially from gas-works and coke-oven products. From reference to tar analyses, it will be seen that only a small quantity of naphtha and light oil products can be obtained from the latter source.

Recently a new phase has arisen in respect to gas-works tar. I refer to the new system of vertical retorts. In Sunderland, we have the first installation erected in England on a large scale, of the Dessau pattern; and the results bear out fully the advantages the inventors have claimed, and the local engineers expected. It appears likely that within a few years gas-works retort-house practice will see a very extended use of vertical retorts.

The subjoined analyses show comparative tar yields from a variety of sources. The table is drawn up based on the relative densities of the tars indicated.

Blast-furnace tar shows by far the lowest specific gravity; but this is not explained by a large percentage content of light (or naphtha) products, but by the low specific gravity of all the distillates. The pitch contains 5 to 10 per cent. of ash, 65 to 70 per cent. of volatile matter, and 15 to 20 per cent. of free carbon.

Coalite tar shows 12 to 14 per cent. of light paraffin bodies that are found in the earlier fractions; an abnormally low free-carbon content; and bright, lustrous, brittle pitch. The tar acids are high, but contain very little phenol.

Vertical-retort tar has a very low free-carbon content; low naphthalene; and gives a brittle pitch, besides containing more than traces of the paraffin group.

Water-gas tar, of which not a considerable quantity is produced, shows a very little free carbon; considerable quantities of creosote and heavy oils; and a poor quality of pitch.

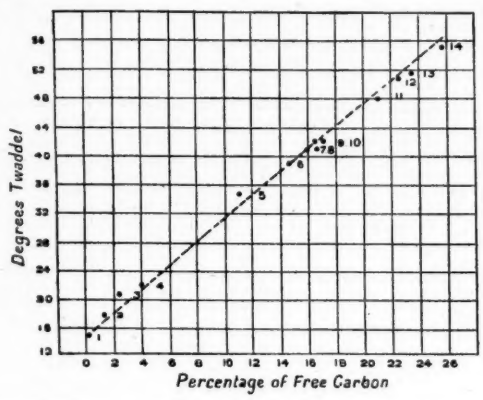
Durham coke-oven tar more nearly approximates to ordinary gas-works tar. The free carbon contained is 10 to 12 per cent. The pitch residue is lower, however, than in a normal tar by roughly 10 per cent.

Normal North Country gas tar reaches the highest specific gravity, greatest pitch yields, and consequently a higher volume of free carbon. Naphthalene is contained in large quantities in both the Durham coke-oven and North Country coal-gas tars.

* See "Journal," Vol. LXXIV., p. 597.

Table I.

Type of Tar.	Coal Source.	Specific Gravity.	"Free Carbon."	Tar Acids.	Distillate through Open Retort					Pitch.	Analyst.
					to 170° C.	to 230° C.	to 270° C.	to 300° C.	to 350° C.		
Blast furnace.	..	0·954	..	..	..	2·9	..	6·97	33·0	55 to 60 p. ct.	Hooper
Coalite	..	1·058	0·15	23·0	..	14·0	13·6	..	29·0	41·7	Hooper
Coalite.	..	1·070	..	..	10·8	..	20·0	..	30·0	39·2	Warnes
Vertical retort	Silkstone	1·084	3·6	..	6·7	..	21·7	..	22·5	48·5	Lunge
Water gas tar.	Durham	1·090	1·38	nil	..	5·8	9·16	..	34·34	34·91	Hooper
Water gas tar	..	1·092	trace	..	1·39	15·45	..	..	42·39	18·23	Tutweiler
Inclined retort (Bueb)	..	1·095	2·6	..	4·4	..	28·5	..	19·2	47 5	Warnes
Vertical retort	..	1·100	2·4	..	5·85	..	12·32	..	26·9	49·75	Lunge
Coke oven (Simon-Carvès)	Durham	1·106	..	..	1·6	4·7	..	18·0	34·0	30·5	Lunge
Vertical retort (Dessau)	Durham	1·113	4·0	5·3	13·0	..	24·0	..	9·0	50·0	Hooper
Chamber retort	..	1·180	11·1	..	0·4	..	10·2	..	30·1	53·9	Warnes
Coke oven (Otto-Hilgenstock). . . .	Durham	1·198	10·5	3·0	9·4	..	9·8	..	24·8	51·0	Hooper
North Country (horizontal)	Durham	1·220	17·25	3·0	4·9	..	18·4	..	9·0	60 6	Hooper



	Tar.	Degrees Twaddel.	Free Carbon by Formula 0·64 *N*-10.	Free Carbon found Experimentally.
1.	Coalite tar	15·0	0·4	0·15
2.	Water-gas tar	18·0	1·52	1·38
3.	Vertical-retort tar	21·5	3·77*	2·50
4.	Dessau Durham coal tar	22·0	4 08	4·00
5.	Horizontal . . . . . *a.*	35·0	12·40	10·97
6.	,, ... *b.*	39·0	14·83	14·91
7.	Average tar	41·2	16·36	16·00
8.	Inclined-retort tar	41·0	16·24	16 54
9.	Horizontal-retort tar . . . *c.*	42·0	16·88	16·51
10.	,, ,, ,, . . . *d.*	42·0	16·88	17·23
11.	,, ,, ,, . . . *e.*	48·0	20·72	20·78
12.	,, ,, ,, . . . *f.*	57·0	22·64	22·64
13.	,, ,, ,, . . . *g.*	51·5	22·06	23·52
14.	,, ,, ,, . . . *h.*	54·5	24·88	25·58

* This determination was not made in the author's laboratory; and he is unable to test its accuracy.

In the accompanying diagram (which has been prepared after closely testing a variety of tars), we find that the percentage of free carbon can be closely and easily determined by the formula—

Percentage of free carbon = 0·64 *N*-10, where *N* = degrees Twaddel.

The statement is based on this figure. The figures are calculated on the tar free from water, and the free-carbon content has been estimated by washing the tar with approximately 150 runnings through the Soxhlet apparatus, with, first, benzene, secondly, pyridine bases testing by distillation in a Wurtz flask 90 per cent. at 140° C., and, thirdly, methylated spirit (unmineralized) in about 50 exhaustions each. These solvents seem to be the best for this purpose. The free carbon yielded no further soluble bodies to carbon bisulphide or other solvents by which it was tested; and the weight proved constant when dried at 120° C. for a considerable period. The composition of the free carbon is being investigated.

Beyond the tars mentioned, but still worthy of note, are those produced from Mond gas, oil gas, and producer gas.

Another process should not be passed over without notice, although the future of the process is hardly out of the experimental stage. I refer to low-temperature carbonization and its products, as exemplified in the coalite process. The tar made under these conditions approaches very closely to that made in the earlier days of the gas industry with cast-iron retorts. This tar is very thin and does not contain much free carbon.

Quantity of Raw Material Available.

The Board of Trade figures show an output of coal for 1909 from the United Kingdom of 263,774,000 tons; giving direct employment to 1,013,998 persons—an increase over 1908 of 26,185 persons. Of this, 15,000,000 tons were used in the production of coal gas. This gives, based on the yields of 8·1 gallons of tar per ton of coal carbonized, an available quantity of tar equal to 750,000 tons. We may reasonably assume an output of not less than 150,000 tons from bye-product recovery ovens, and not less than 200,000 tons of blast-furnace tar is produced. Water-gas tar, coalite, and other tars are at present an almost negligible quantity. We have, then, in sight a total of about 1,100,000 tons of coal tar available.

It must be borne in mind that very large quantities of tar are lost to the distillers annually to the gain of the surface of our highways. In the southern counties, especially round London, some thousands of tons, in a refined state, are being placed on the roads to preserve the surface and abolish the dust nuisance. This use is likely to develop largely in the future in other parts of the country.

Products Generally Prepared, and their Uses.

From the first fraction and light oils we obtain: (*a*) Carbon bisulphide (little is, however, prepared commercially from this source). (*b*) Benzene, toluene, and the xylenes, produced in a pure state for dye-manufacturing and solvent purposes. Toluene is the base for artificial saccharine. Benzol (or "nineties" as it is known in the trade) is becoming more and more useful as a spirit for internal combustion engines of a motive character. (*c*) Carbolic and cresylic acids.

The second fraction yields naphthalene, heavier solvents, besides phenolic bodies, and the third fraction yields lower grade naphthalene and oil most suitable for preserving timber.

Of late years, one of the factors which relegates the possibility of tar, or even oil burning, to a distant future is the ever-increasing demand of creosote for the American continent. For many years a considerable quantity of oil has been sent to the United States of America, but during the last five years the demand for timber preserving oil has grown so rapidly that the old method of cask packages has almost disappeared, and instead the oil is being sent to the other side of the Atlantic in properly fitted tank steamers. The collection, maturing, exporting, and the transit and distribution on the other side have now grown to vast proportions. Over 25,000,000 gallons were received from England in 1909; and the demand is still growing. Six years ago, oil burners were installed at the Sunderland works to use up some of the excess of oil produced, which was over and above the demand of the local firms using creosote. Since then the vista has changed remarkably, and now the oil has a steady outlet. The manipulation of this oil, liquid only at an elevated temperature, requires special experience and handling. There are now more than five shipping installations in Great Britain alone. The demand came at a very crucial period to tar distillers, and has proved of value at a time when it would have been difficult to dispose of the excessive make.

The fourth fraction gives anthracene (not extensively separated of late years) and heavy oil. The latter is now being largely superseded in the manufacture of lubricating oil by imported petroleum bodies. Carbazol is also obtained from this source. To show the fall in the value of anthracene at the present time, in 1908 only £5094 worth was exported; in 1909 material to the value of a few hundred pounds was wanted abroad.

Methods of Separating the Products.

By far the greater proportion of the tar is worked up in this country by the ordinary pot or intermittent stills. The usual design of a tar-still is convex-concave—an upright cylinder with domed top outwards, on the top surmounted by a cast-iron still-head. The still bottom is domed upward inside, to give a maximum of heating surface from underneath.

The capacity may vary from 8 to 20 tons. Steel or wrought iron is the material employed for the manufacture of the still; the thickness generally used being about ½ inch. The top of the still below the head usually consists of a dome plate riveted to gusset plates; these, in turn, being joined to the cylindrical shell plates. Below these the channel or floor plates are riveted to the lower gusset plates, and these again to the internal dome plate. Some distillers favour a single plate covering the bottom entirely. These large plates can now be procured. The fittings consist of the still head, safety valve, inlet for tar, inlet for steam, testing cock, and pitch run-off pipe. Some ten to thirty hours are required, according to circumstances, for the cycle of operations. Briefly, this is as follows: The chargemen fill the stills to a certain mark, and run the distillate with fire heat till the last fraction, the heavy anthracene oil, begins. Then steam is injected, and the distillation proceeds to the finish. The fractions are in some cases determined by a thermometer in the still dome, but generally by the specific gravity of the fraction and by the quantity of the distillate and its appearance on a steel blade. This factor is largely determined by the commercial requirements for the time being.

The main advantage of the pot form of still is that as a still becomes worn, and the wear and tear is great, one still or another can be put out of use without the plant, as a whole, lying idle. In some works the stills run under partial vacuum, and consequently lower temperatures are required and more perfect condensation of the earlier products results.

The stills are sometimes fired with other fuel than coal—viz., coke, oil fuel, or producer gas. With tars of a lower free-carbon content, no form of internal agitation in the still is necessary; but much may be said for this method with some denser tars.

The condensing arrangements for the distillates consist of steel or iron tanks containing a coil of steel or cast-iron pipes of requisite internal diameter, from 100 to 150 feet in length. The pipes terminate outside the tanks in a goose-neck trap into a receiving chamber, whence the running of the stills may be observed, samples taken, and out of which the products may be transferred to their proper store-tanks for further treatment. The first fractions are sent from their store-boilers to a crude-naphtha still, which is similar in design to a tar-still, with the exception that it has, in the place of an ordinary still head, a fractionating column of some approved design. This still is worked, as a rule, by fire, and the distillate tested and the fractions separated by control from the laboratory, by means of continuous specific gravity and distillation tests. The residues from the still are highly charged with naphthalene and are run into the creosote tanks. The distilled products from this plant go to the benzol washing-house, where, after treating with sulphuric acid to eliminate the basic bodies, and with caustic soda to remove the phenols, further acid treatment takes place to remove the more easily sulphonated bodies. Thence they pass to the steam rectifying still for the preparation of either benzol or toluol, or higher-grade benzene, toluene, and other xylenes.

The light oil and carbolic oil fractions are often re-distilled, as is the first fraction, and washed with sulphuric acid and soda also. From this source the later fractions give high-grade naphthalene.

This latter product is passed to the naphthalene plant, where, by means of hydraulic presses or centrifugal machines, a high melting-point "salt" is obtained, especially after re-distillation in a proper still, without difficulty.

The creosote fraction contains basic bodies of little commercial value; but considerable quantities of phenolic bodies may be secured by washing, and, if necessary, naphthalene. The main bulk of the material, however, is utilizable without much treatment for timber preservation.

The anthracene fraction comes from the still as a dark yellowish green oil of buttery consistency when cold, and yields no basic or phenolic bodies of interest other than carbazol. When anthracene had a high commercial value, this was an important fraction. At the present time, however, it does not pay most works to extract the anthracene, except to prepare heavy oil for lubricating purposes; only a high-grade "A" quality anthracene being worth any consideration.

The residue left in the still at the termination of the distillation is pitch. This body, or, more correctly speaking, this combination of bodies, is used almost exclusively for the purpose of briquette manufacture.

Dehydrators.

Retracing our steps to the tar as first received at the works. Of late years it has been found desirable to arrange some method for eliminating as much of the ammoniacal liquor as possible before the tar enters the still, and many means have been devised; the favourite one being to have a receptacle heated by waste steam or flue gases, or even conjointly with the condensers, to heat the tar to a point at which the water rises to the surface and distils over, or by means of a separate plant and series of various shaped stills to drive off some of the water and lighter products before the tar is taken to the tar-stills for further distillation.

An engineering company in London has recently brought forward a plant capable of dealing with water in tar, and also for the simultaneous extraction of the naphtha and light oils. The crude tar is pumped through a pre-heating coil, and thence to a coil still in which a temperature of over 100° C. is maintained. Passing from this still, the vapours are drawn off and condensed; and the tar, free from water, passes from the apparatus. The principle is good, and might well be further developed.

Continuous Stills.

First among this class of still in point of age, and also in the amount of tar worked through them at the present time, is the still designed by Mr. Frank Lennard, of Messrs. Forbes, Abbott, and Lennard. This still consists, in the first instance, of a long series of pipes laid in a furnace and carefully heated. The tar is pumped, under pressure, through this series of pipes running gridiron fashion backwards and forwards from one side of the furnace to the other. The tar is heated by this means to pitch temperature, and then, as the end of the furnace is reached, each fraction is allowed to condense in its order. The pitch remains at the first stage; next, the anthracene fraction is allowed to cool, and further creosote; then light oil and naphtha. The last condensing plant is wisely utilized to heat the crude tar before entering the furnace at the commencement of the operation.

It appears desirable to heat the furnace by means of some method other than by coal-fire so as to obtain a regular temperature, which is the essence of the successful carrying out of the process. Properly speaking, this method should be indicated as a fractional condensation method of tar distillation. Another form of continuous still has been patented by Herr W. Hugendick, of Essen-Ruttenscheid, who combines a pre-heater of pipes behind the still somewhat allied to the Lennard pattern, with a series of pot stills, and heats the tar before entering the pot stills with the chimney flue gases.

Another type of continuous plant is that designed by an Italian, Sig. Ettore Ray. This plant does not appear to have been extensively tested. Its principle is that of heating the tar in a chamber at a considerable elevation, and with one or more still heads. The light products are worked off in this chamber and thence to lower and still hotter chambers; eventually pitch being run off at the bottom as the final product. The characteristics of this form of fractional distillation appear to be of a correct type; but whether the plant can stand the crucial tests of present-day practice, I have no information. Messrs. Poetter, of Dortmund, also have a plant of somewhat similar plan; but as far as I can learn, no large plant of this design has been erected.

In conclusion, a few figures which are submitted as to the general chemical trade of the country, and tar products export trade in particular, may be of interest. The chemical exports for the United Kingdom have risen in value from £12,079,000 in 1903 to £17,059,000 in 1907, and later (but incomplete) figures point to a continued annual rise. The imports of dyes and dyestuffs from January to December, 1909, were as under:—

	Cwt.		Value.
Alizarine and anthracene	55,901	..	£244,196
Aniline and naphthalene	239,956	..	1,318,727
Synthetic indigo	33,494	..	117,100
Other coal-tar dyes	713	..	3,965
			£1,683,988

These figures point to the fact that while we import tar colours of considerable value, the balance of exports from the tar-products industry goes a considerable way to pay for the material imported.

United Kingdom: Export of Coal-Tar Products from January to December, 1909.

	Quantity.	Value.
		£
Aniline oil and toluidine . . . lb.	2,075,579	44,380
Anthracene . . . . . lb.	1,807,762	5,712
Benzol and toluol . . . . . gallons	2,374,681	80,987
Carbolic acid . . . . . cwt.	95,001	103,189
Coal tar, crude . . . . . cwt.	102,598	13,629
Refined tar and black varnish . gallons	2,692,080	43,630
Naphtha . . . . . gallons	773,240	27,089
Naphthalene . . . . . cwt.	90,376	21,880
Pitch . . . . . cwt.	9,959,629	595,651
Tar, oil, creosote . . . . . gallons	26,839,561	399,994
Other sorts . . . . . gallons	395,719	120,069
		£1,456,210

Uses for Tar Other than by Distillation.

Having considered the coal-tar distillation industry as such, it is worth while noticing briefly the uses of tar in other directions. As fuel, by itself or with coal or coke, it is consumed, especially at long distances from tar-works. It is used in ever-increasing quantities, but not with the best expert advice, in rendering roads dustless, especially where motor traffic is considerable. Those who have gained experience almost unanimously press for refined tar of make suitable to each district. Tar also finds its way into coal briquette factories, where the blocks are subsequently partially coked to get rid of the oily condition inseparable to the use of crude tar. A small quantity is also used in the manufacture of carbons for the electric arc.

Solvene for Preventing Naphthalene Deposits.

In consequence of complaints made of deposits of naphthalene in the street mains, Mr. Isaac Carr, the Gas and Water Engineer to the Widnes Corporation, began last summer to wash the gas with water-gas tar; and some improvement was effected. In October, however, matters became worse. He then substituted "Solvene" for the water-gas tar; and in his monthly report for November he was able to inform the Gas Committee that since its use was commenced there had been a falling-off of about one-third in the number of complaints. We now learn that they have entirely ceased. Mr. Carr is continuing to use "Solvene," which, as readers are doubtless aware, is a specially prepared solvent from which all the light boiling naphthas which evaporate very quickly, and all the higher boiling oils (such as creosote) which extract the illuminating hydrocarbons from the gas, are eliminated. It is run into the washer, wherein it absorbs the naphthalene, and prevents its deposit in the mains. The quantity used per 100,000 cubic feet of gas produced is estimated at 1½ gallons. It was put upon the market some years ago by Messrs. Brotherton and Co., Limited, of Leeds, who claim for it that it is the best solvent now in use for its special purpose. They state that, in the case of one of their largest buyers, they had more than 30,000 obstructions in the mains before using it; whereas in a corresponding period during which it was employed, there were only 100. This appears to justify the claim made for the solvent.

Buying Coal on Analysis.

The "Iron and Coal Trades Review" says interest appears to be growing in this country, as well as abroad, in the system of purchasing coal on analysis. This is already in vogue to some extent; but it is now sought to make it much more general. In cases where a rational basis for specifications can be agreed upon, our contemporary thinks the results of the practice may be beneficial to both producer and consumer, as it enables the latter to indicate precisely what he requires, while the former can tender in a more intelligent manner; and equitable settlements are not very difficult. Unfortunately, however, it is by no means easy to find or to persuade framers of such specifications to adhere to a "rational basis." On the contrary, specifications have, it is stated, been adopted in a number of cases which are impracticable and unnecessarily stringent, which do not prescribe any satisfactory methods of sampling or testing, and render premiums impossible and penalties inevitable on coals of which the prices are already so low as to leave no possibility of profit to the consumer except by involving extensive and permanent waste in mining. If guarantees of quality become more generally required, something might, it is thought, be done to standardize specifications, and to eliminate from them those extreme conditions which tend to render the system ridiculous, and incline a great many buyers and sellers to adhere to the old plan of relying upon the integrity of the contractor or the reputation of the mine and district supplying the coal. In any case, sudden attempts to introduce generally a system of ill-digested specifications are likely to result disastrously to both producers and consumers.

The London and Southern District Junior Gas Association have, we are informed, cancelled the visits which it had been arranged should be paid next Saturday to the Westminster compressing station and Lloyd's printing works.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Quarterly Meeting in Dundee.

Last Saturday afternoon, the members of the Eastern District Division of the Scottish Junior Gas Association held a quarterly meeting in Dundee. A large contingent of the members reached Dundee early in the day; and, by invitation of Mr. A. Yuill, the Corporation Gas Engineer, paid a visit to the gas-works. The meeting was held at four o'clock, in the New Technical College, Bell Street, and was very well attended; there being about forty present. Mr. W. DUNLOP, of Kirkcaldy, the President, occupied the chair, and introduced Mr. Yuill to address the meeting.

ADDRESS BY MR. YUILL.

Mr. YUILL, in the course of his address, said: Among the many changes from the old order of things, the carbonizing department has occupied a foremost place, not only in the form of the retort itself, but also in the manipulating of it. The student of gas manufacture has now to make himself conversant with all the latest phases of regenerative settings—the horizontal form, ranging from 2 to 12 retorts per oven, the inclined settings, and machinery applicable to them, and also the newer form of verticals. In the construction of new works, the vertical form of retorts demands consideration, from the lessened cost at which coal can be carbonized. On the other hand, in works having a good installation of horizontals, economies may be effected with through retorts expeditiously charged and discharged with machinery, and at a cost little above the results obtained with verticals, more especially when interest and sinking fund charges are included.

There is one phase of gas management that is rising into prominence, and one that has not occupied among gas engineers the position it deserves—viz., the commercial. Anyone reviewing the proceedings of Gas Associations in the past is reminded to some extent of this defect by the absence of papers dealing with this subject. I am pleased, however, to find that in all well-conducted corporations or companies this is now being remedied; and it tends to financial benefits, not only to the company or corporation, but also to consumers. The time has now gone when managers of gas undertakings can view with apathy or indifference the complaints or requirements of consumers. This no doubt has been brought about by our friendly rivals; and it is a matter of fact that the consumption of gas has increased in a greater ratio the last decade or two than in any similar period during the past.

In well-regulated works, every effort is made so that costs are reduced to a minimum by the introduction of labour-saving devices; and in no department is this more fruitful of economies than in the retort-house. I do not wish it to be understood that economies may end there, as it will be found that every department may have within itself some source of leakage which ought not to be. I know of no better help than what may be termed "systematized statistics." The weekly wages account ought to be apportioned among the various departments, compared with the gas made, and worked out to the second or third place of decimals, and comparisons made with corresponding periods from time to time. Furnishings ought to be dealt with in the same manner—monthly and quarterly accounts compared. If the cost is more than in the previous period, then satisfactory reasons require to be given. Possibly some may say this system is all very well in large works. Do not excuse yourself under this false idea, as it is applicable to all. Everyone will be the better for knowing that his results are greatly in excess of those of his neighbours.

With the increased demand for gas cookers, grillers, rings, &c., there are always a few being exchanged and removed from empty houses. Before these appliances can be sent out on loan again, it is a most essential matter that they should be properly renovated. Under the old process, the stoves, &c., were scraped and cleaned with a wire brush, removing the accumulated grease or dirt. This was found a most tedious operation, and could by no means be designated a congenial job. To accomplish the work with economy, efficiency, and also on hygienic methods, a sand-blast plant has been installed at Dundee, consisting of an air-compressor, receiver, cleaning-room, sand-blast apparatus, sand-settling box, and exhauster. The air, which is compressed to 15 lbs., passes into the receiver, and thence to the two-pressure apparatus, which produces the sand-blast by the intimate mixing of quartz sand and air. To the apparatus is attached a length of india-rubber hose with a nozzle at the other end, which is held by the operator and directed on to the article being cleaned. The cleaning-room is made of match boarding, well grooved and tongued, and lined with sheet iron. A turntable, fitted with exchangeable grids which can be turned in either direction by a winch, forms the floor of the room; and on this the articles to be treated are placed. Windows and a skylight are provided; also a sliding or other door to close the room. After the articles are placed on the turntable, the door is shut, and the operator plays on them with the hose, and observes the progress of the work through the window in front. As the articles in front of him are finished, he turns the table by means of the winch. After all the articles are treated, the door is opened, and they are either turned over or removed as necessary. The sand used drops through the grids of the table into a trough, in which a spiral conveyor takes it to a bucket elevator, which delivers it through a shoot into the two-pressure apparatus for further use. The dust-laden air is withdrawn by an exhauster, and, after passing through a sand-settling box fitted with baffles, in which the heavy particles of sand gravitate, it escapes into the open. By the use of this apparatus, we have been able to do in one hour what took ten hours by hand labour.

We have heard a good deal of late regarding the smoke abatement question; and it is surprising to find that local authorities have been so apathetic. I have always considered that domestic fires have been greater sinners in the past than they get credit for. It is admitted by all scientists that cooking and heating by gas would lessen to a considerable extent the most unpleasant aspects of our winter fogs. The more this subject is ventilated, and every encouragement given by companies and corporations to their respective consumers, the sooner will the dawn of brighter days appear.

It may be interesting to give a short *résumé* of the method adopted for dealing with the orders received in connection with the stove department in Dundee. Prior to the gas exhibition held here October, 1909, there was no card system in use; but, owing to the immense success of the exhibition, during which about 2000 orders were booked, it was found necessary to arrange for some simple and effective method of handling this increased business. The following are details of the system at work: The department's operations are classified under seven heads; and for purposes of identification, the cards are of assorted colours.

A. *Complaints (Green).*—These cards deal with complaints received at the town office, regarding faulty cookers, escapes in cooking or heating appliances, &c., or any item which may not come properly under the other heads.
B. *Cooking Appliances (Buff).*—Applications for cookers, hot plates, grillers, and rings. The inspector calls, finds out what is required, decides on the size of appliance to be fixed, takes measurements, also particulars of meter, &c. All these are entered on the card, and completed by the gas-fitter when the job is finished.
C. *Exchanges (Blue).*—Applications for exchange of cooker for larger or smaller size, or for other cooking appliance, also exchange of heating appliances, are dealt with by the same card. These are first negotiated by the inspector, and the job completed by the gas-fitter.
D. *Heating Appliances (Deep Pink).*—In applications for gas-fires, radiators, &c., the same procedure is followed as with cooking applications.
E. *Removals (Light Pink).*—In the case of parties removing from one house to another, and wishing to take their apparatus with them, this card deals with both heating and cooking appliances.
F. *Returns (Slate).*—Apparatus to be returned to works.
G. *Sales (Light Yellow).*—Appliances (heating, cooking, or otherwise) not usually given on loan or hire, but purchased by consumers, and requiring to be delivered and fitted.

The cards are all brought in as soon as a job is finished, and handed to the foreman, who examines the reports to see if all is in order. Each day's completed cards are handed to the clerk, who writes-up the return sheets, giving the necessary reports for entering in the Treasurer's ledgers. The return sheets are of corresponding colours to order sheets and cards, thus preserving uniformity. It should also be noted that all orders have an office reference number and works reference number. These numbers appear on both cards and return sheets. This is essential for the tracing of any job.

We have also adopted a complete card system in dealing with meters and complaints regarding gas supply. It is worked by a separate staff at our Irvine Square workshops, and is independent of those attending to the fixing and removing of cooking-stoves, gas-fires, radiators, &c. The system has been in operation for upwards of twelve months, and has proved a great success.

In taking a retrospective view of the position of matters, it is comforting to find the steady progress that has been made, despite the fact that our competitors have taken to some extent the cream of our lighting consumers, more especially in shop lighting in our principal streets. Taking the statistics for the United Kingdom, I find that in 1900 there were 156,665 million cubic feet of gas consumed; and that last year the total was 199,083 million cubic feet, or an increase of 42,418 million cubic feet. This may appeal to the lay mind, when it is mentioned that about 20 million tons of coal are now required to satisfy the requirements of gas undertakings, and no less than 450,000 tons of coal are needed to meet the annual increase. During the first decade of this century, I find that consumers have increased by 67 per cent.

The extended use of cooking-stoves is assisting to a considerable extent in the solution of the smoke question. They now number 1,910,000; showing an increase of 228 per cent. for the past ten years. I am also pleased to note the growing appreciation of heating by gas. The old prejudice, born of ignorance, is rapidly fading away. Nothing has tended more to bring about this state of matters than the research and investigations made by the medical faculty, both from scientific tests and practical and personal observations.

The PRESIDENT was sure he expressed the sentiments of all present when he said they were indebted to Mr. Yuill for giving them so good an address. He always felt, in listening to Mr. Yuill, that he had a store of information to draw upon which few possessed. He was certain that on the present occasion they all

had this feeling; and he had great pleasure in proposing a hearty vote of thanks to him for his address.

Mr. YUILL acknowledged the vote.

HIGH-PRESSURE DISTRIBUTION.

Mr. J. MITCHELL (Dundee) read a paper on this subject, in the course of which he said:

As a member of this Association, I feel it incumbent upon me to place before you particulars regarding the high-pressure installation introduced at Dundee Gas-Works during last autumn. The question of giving an adequate supply of gas has been aggravated of late years by the change that has taken place, not only in the gas supplied, but by the introduction of incandescent lighting, and of cooking and heating, which necessitates a higher pressure than some years ago, and also a more constant supply.

Prior to installing the high-pressure plant, numerous complaints were received regarding the want of pressure over certain parts of the city. It was found impossible to maintain a proper supply in some districts, owing to the heavy consumption during the maximum lighting hours, with the result that the mains became exhausted by the increased and increasing demand along the route which they serve on their way to the outlying districts. It therefore became the duty of the department to consider how these difficulties were to be overcome, and how the consumers in these districts were to be provided with an adequate supply of gas at a pressure equal to, but not greater than, that obtained by consumers in the central districts. It was impossible to increase the pressure on the existing mains, for two reasons—namely, that by endeavouring to improve the pressure on those districts already noted, by giving more pressure to the mains leaving the works, the central area and the routes of the mains would have had too great a pressure; and even then the outlying districts would not receive the necessary pressure, because of the inability of the existing mains to convey the volume of gas required to maintain such a pressure.

To meet the situation, and provide a sufficient supply in every district, two systems were possible—the high-pressure distribution scheme at an estimated cost of £3250, or the laying of new mains to Lochee and Downfield on the low-pressure system, which would have involved the laying of 18-inch cast-iron pipes, at an estimated cost of £8000. With the old system of large mains, the same difficulties would still have prevailed, though, of course in a lessened degree. If pressure had been increased at the works to give pressure in Lochee and Downfield, the pressure *en route* would have been too high; and, owing to the different altitudes in various parts of Dundee, it would have been impossible to regulate the pressure to suit the varying requirements of several hours of the day in different seasons of the year. High-pressure distribution was therefore adopted; being the most economical, satisfactory, and equable to all consumers. An ideal system of gas distribution is one which enables every consumer to be supplied at a uniform pressure. To do so in Dundee under the old system was impossible, as the pressure at the beginning of the route was in some cases too high, diminishing steadily *en route;* the pressure at the extreme end being much too low.

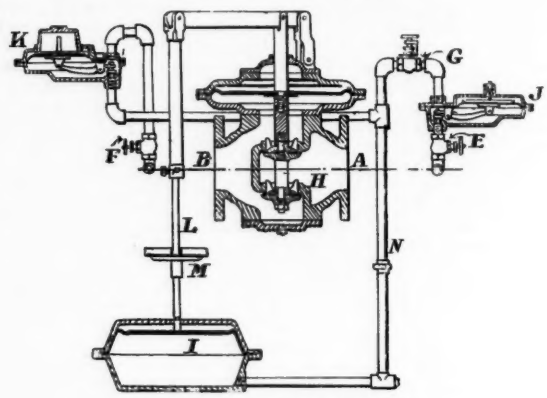
Before describing the plant generally, I should like to give any members present who are not familiar with the City of Dundee an idea of the outlying districts where the governors have been installed—Lochee, Downfield, and Hilltown. Supplying these districts on the low-pressure system, each has its separate trunk main. In the meter-house, there are five regulating bells for working the "Foulis" patent underground type of governors, which are located 200 feet distant from the meter-house. There is one 30-inch diameter, three 18-inch, and one 10-inch, each provided with inlet, outlet, and bye-pass valves. The lead pipes from the regulating bells to the governors are laid in a brick trough covered with bitumen. Therefore the town's supply is under the close observation of the meter attendant; the pressure on each governor being recorded every hour during the period of lighting. The main-pipes leaving the works correspond with the governors. There are five gasholders at the works, and one at Lochee; those at the works giving a pressure of 50-10ths.

Owing to the increased demand for gas appliances, it has been found necessary to maintain a higher pressure through the daytime, as well as during the evening. Since the introduction of incandescent burners, the tendency has been to increase the pressure; and now it is found that, to obtain the best results, a steady pressure must be maintained with at least 25-10ths. With this increase of pressure on the mains, some may say a corresponding increase of leakage is sure to take place. Why should this be so, if the joints are well made? In looking over the statistics of gas undertakings (say) for twenty years past, one is confronted with the fact that the percentage of gas unaccounted for is considerably less now than at the former period. This may be due to the better attention given to the mains when being laid, to the elimination of cast-iron services and small cast-iron mains, the laying of larger mains, and the higher pressures now ruling; the latter having a tendency to make an escape noticed as soon as it has taken place, instead of oozing for possibly weeks as was previously experienced.

Taking Hilltown first, the name describes the district. The highest point is 339 feet above the level of the gas-works; the area being approximately three-quarters of a square mile. A decrease of pressure at this level indicates a heavy consumption, which is the reward for giving easy terms to consumers. Downfield lies north of Hilltown; the lowest point being 305 feet, which shows a fall of 34 feet from the highest point. Before the introduction of the high-pressure system, 19-10ths pressure only was obtained at the last lamp, which is three miles distant from the gas-works; the decrease of pressure in this district being due to the heavy consumption *en route*. Lochee, on the other hand, has a station gasholder, which is fed automatically by an arrangement of two governors—10-inch and 3-inch. The 10-inch governor is weighted to supply gas from the holder should the pressure in the district fall below 25-10ths. The 3-inch governor is of the diaphragm type, and is set to feed the holder when the pressure in the district exceeds 26-10ths.

The following are the most essential parts required to complete a high-pressure installation: (1) Gas compressor. (2) Pulsation and baffle tank. (3) High-pressure main. (4) District governors. In selecting a compressor, the working pressure determines the type required. Fans are found unsuitable for pressures over 20 inches, as they lose their efficiency above this pressure. There would also be considerable expense involved in an installation of this kind, owing to the size of mains that would be required.

The plant installed at the Dundee Gas-Works is of the rotary exhauster type, manufactured by the Bryan Donkin Company. The engine is of the vertical non-condensing type, with two cylinders, each 11 inches diameter by 6-inch stroke, with valves of the balances piston pattern. There are two compressors, one on each side of the engine. They are capable of passing together 30,000 cubic feet of gas per hour against an ultimate outlet pressure of 10 lbs. per square inch, when running at a speed of 200 revolutions per minute. There are two fly-wheels on the engine, the boss of one acting as a coupling connecting the compressor with the engine direct. The engine and compressor are on the one baseplate. The steam supply is controlled by a diaphragm steam regulator and equilibrium throttle-valve, which is sensitive to 1 oz. pressure per square inch. The action is automatic in accordance with the pressure in the main. The plant is also fitted with an excess pressure valve and steam regulator, which can be adjusted so that the gas need not be compressed beyond the point necessary to give an adequate supply to the outlying districts.



Reynolds' Single District Governor.

The difference between a rotary compressor and a Donkin exhauster is that the centre-block in the compressor acts as a drive, whereas in the exhauster it acts as a guide to the slide. The cast-iron drum in the exhauster drives the slides; but in the compressor the slides drive the drum. A feature in the design of the compressor is that the nose-strips fitted at each end of the slide or piston have a surface contact, as opposed to the line contact only in an ordinary gas-exhauster. In this design, the shaft comes through both ends of the compressor, consequently enabling a steel shaft to be used, giving a strong and more rigid job. To avoid any fluctuation or pulsation on the main, and also to arrest any condensation, there is a baffle-tank on the outlet of the compressor, similar in design to the silencer of a motor-engine. The inlet-pipe runs the full length of the tank, with small holes bored to equal the area of the pipe. This is found most efficient.

With high-pressure distribution, it is all but universal to use steel mains. Not only are they better adapted for this class of work, but there is a great saving both in first cost and in laying them. The average length is 20 feet, compared with 9 feet for cast-iron pipes, involving a saving in jointing material, and also in labour. The total length of the new main is 4 miles—2 miles of 6-inch 10 W.G. gauge and 2 miles 4-inch 11 W.G. gauge. The pipes are lapwelded, with a covering of jute cloth tarred; and the joints are covered with the same material.

Before starting to lay the main, the compressor was completed, which enabled every joint to be thoroughly tested to 12 lbs. before being covered in. After every test, the engine was kept running for five minutes with an open end, thus preventing dust from being carried forward to the governors. The joints have two strands of yarn; the remainder being lead wool well caulked. A solution of soft soap and water was used for testing the joints, and was found most efficient for this purpose. The usual practice was to keep the pressure on through the night; the average loss (due to condensation) being infinitesimal. Special drips were used, the flanges on both drip and cover being turned, and jointed with a

lead ring. The syphon-pipe is screwed into the cover, and has a lock-nut on each side with a Mueller high-pressure cock on the end of the pipe. Working under low pressure during the day there is no difficulty in pumping the drips. Between the east end of the town and the west, the Law Hill intervenes. Reynold's district governors have been installed at the most suitable points of the districts under consideration.

Having given you a few details of the low-pressure system, I shall now describe the governors referred to. A is the main high-pressure inlet and B the outlet. J and K are the secondary governors; J reducing the main inlet pressure to about 10 inches, and K giving the pressure required on the district. G is a needle valve with a graduated brass scale for reducing the pressure between J and K. E and F merely act as stop valves when shutting down the governors. I is the auxiliary pressure bowl with the intermediate pressure acting on a diaphragm. Once the secondary governors reach their maximum capacity, and the demand for gas is still increasing, the pressure in the pipe N connecting the secondary governors to the auxiliary bowl falls, which brings the main governor into action by means of the rod L.

Should there be a falling off during the daytime, then the secondary governors come into action and maintain the supply, no matter how small it may be. Consequently, when the secondary governors are maintaining the supply, you have a pressure acting on the under side of the auxiliary bowl which is keeping the main shut. The secondary governor K is weighted to give the outlet pressure required on the district. Once the pressure on the district increases, K becomes closed, at the same time the intermediate pressure rises between J and K, putting the governor out of action. There is also a stop-valve on either side of the high-pressure governor H. Should it be found necessary at any time to examine the governor H, these valves are closed, and access is gained through a hand hole on one side of the valve casing. The governors being in duplicate, though not necessary, afford ample opportunity for examining, &c.

When starting the governor after an inspection, all valves should be closed. Under no consideration should the high pressure act directly on the leather diaphragms. During the daytime we work the governors with the holder pressure, which is 50-10ths, and the high-pressure during the evening. Acting under these conditions, the valve G requires closing slightly. With the holder pressure on and the main governor shut, J is regulated to maintain a pressure in the bowl I. Weights are removed from the carrier M, as the reduced pressure would not be sufficient to overcome the weight of the rod L and the levers, governors are capable of maintaining a given outlet pressure in inches water gauge, with either holder pressure or high-pressure at the inlet, without alteration, when once adjusted. Under these conditions, we obtain very satisfactory results. At first one would be likely to think this type of governor too complicated for the average man employed on a gas-works. This, I may say, is a false impression, as, from experience, we find that there is nothing more to look after than would be met with in an exhauster house. Owing to the small amount of headroom required, they can be fixed beneath the roadway; thus obviating the necessity of acquiring land for the purpose of building a governor house.

The governors are enclosed in pits on the footway, 9 ft. by 6 ft. by 5 ft. 6 in., with roof lights. Gauges are connected both on the high-pressure inlet and low-pressure outlets; a Bourden gauge being used for the high pressure, and the usual water-gauge for low pressure. There is also a Simmance and Abady dry pressure register in each pit. This form of register is not subject to the same risk during frosty weather. To avoid water collecting in the bottom of the pit, there is a slight fall on the floor, with a sump hole and a drain pipe connected to the main sewer trapped. Under these conditions, the floor is kept dry. Since installing these governors, we have experienced every satisfaction, and have been able to give consumers a steady pressure in the districts already referred to.

Discussion.

Mr. H. Rule (Kelty) remarked that high pressure could be used for many different things. Gas companies could now tap outlying districts at a rate which hitherto had been impossible of attainment. High-pressure lighting lent itself to an ideal system of gas supply, inasmuch as they could put a definite pressure on the mains throughout an entire district. There should be no such thing as reducing the pressure when it came to a certain time of night. There should be a constant pressure the whole 24 hours; and he thought they were agreed that this would give them much better conditions for lighting as well as for cooking. He noticed that in Dundee they had one steam-engine coupled to two compressors; and perhaps Mr. Mitchell would give them the reason for this arrangement. He (Mr. Rule) would have thought that one steam-engine to one compressor, and one to another, as a stand-by, would have been better. In asking quotations for compressors, he considered it would be well that a definite speed should be given for a definite quantity of gas to be delivered. For instance, one type would give 5000 cubic feet per hour, against a certain pressure, at 60 revolutions per minute; while another might require 100 revolutions for the same quantity of gas. Of course, this would mean excessive wear and tear in the second type. A really good, reliable district governor should be used, because it would save considerably later on; cheapness, in this case, being not always best.

Mr. S. Donald (Dundee) said that in London, and he thought in Birmingham also, they were sending out gas at high pressure not only for boosting mains, but also for cookers and gas-fires, and other domestic purposes. It was evident that soon there would be no such thing as low-pressure mains. They would all be sending out gas at from 5 to 10 lbs. pressure, with governors to lower it in the different districts. By this means he thought they would be able to reduce the complaints of consumers, which had been so frequent; and though the initial cost might be serious, he thought the subsequent saving would justify the cost.

Mr. G. Keillor (Broughty Ferry) said that the paper had been highly instructive. They were not all in a position to instal high-pressure plant; but he knew that what they had installed in Dundee was doing excellent work. If the Dundee Gas Committee had put in a new 18-inch low-pressure main, he did not think they would have had so much satisfaction from it as they were now getting from their high-pressure plant. He assumed that the diagrams exhibited were comparative, and that the one showing a straight line was taken on a low-pressure main.

Mr. Yuill explained that the two diagrams were taken at practically the same spot, before and after the governor connection.

Mr. Keillor said the top one showed what a want of pressure there was under the old system; and after the high-pressure main was put in, it gave a fine straight line. This was what they must all aim at. The sooner they were able to maintain a steady pressure at the meter, the better it would be for the gas industry. In Dundee they were tending towards this end; the installation of high-pressure plant being, in his opinion, the latest example of progress in this direction.

Mr. R. B. Waddell (Dunfermline) asked at what point of the town supply the diaphragm of the steam controller was taken. On the diagram of the governor there was an inlet-valve at G. He should like to know what was the necessity for having such a valve, when there was an automatic governor on each side of it. Supposing the valve were altered at any time, and not altered back again, it might have an effect on the pressure. If there was high pressure on the main, any water which might be in the drip-boxes would be blown out, and there would be no need for pumping it. What was the pressure at the inlet of the main governor at A? Also, when the small governors were doing their work, was the compressor still running?

Mr. Mitchell explained that to have two engines to the two compressors would be very expensive; and they used one of the fly-wheels as a coupling, so that if one of them were going wrong it could be disconnected, and the other kept running. The engine could then be run a little harder for a few minutes. If it were to break down, they could put on the gasholder pressure, which was 5 inches. The intermediate pressure between J and K was 10 inches; and to get this they reduced it at G. The diaphragm of the pressure-controlling steam-regulator was taken off the pipe as it left the works, where they carried 5 lbs.

Mr. H. Doran (Granton) asked what reason there was for using lead wool instead of a hot joint for jointing; and also if any loss at all of candle power was found to result from the compressing of the gas.

Mr. Mitchell said the gas absorbed hydrocarbons when it was reduced to 30-10ths again. There was no loss at all due to compression. They had not experienced any loss; and they had had the plant running since October.

Mr. W. B. M'Lusky (Perth) remarked that Mr. Yuill was to be congratulated on the success that had crowned his efforts. He was particularly interested in the Reynolds governor, and, in fact, had adopted it for consumers. It could be rented at 1s. 9d.; and at this figure it would pay. After considering the merits of it and other governors, he believed this one had features which no other governor had. High-pressure gas supply had two aspects. There was the purpose of simply boosting the district; but there was also the other aspect—the question was probably a little more remote, but they would have to face it—of supplying high-pressure gas direct to consumers. The inverted burner had forced upon them the necessity for the pressure, whatever it might be, being uniform during the whole 24 hours. He himself had been successful in keeping an even line. His predecessor divided Perth into three districts, each with a station-governor. One of the mains was not tapped for about a mile from the works. In this way, he had been able to avoid the difficulty they had experienced in Dundee. He rarely had a variation of more than 5-10ths at any point during the 24 hours. But this would not be sufficient by and by. The question of high-pressure would have to be faced. It was for this reason that they had resolved to hire a governor to every consumer who would use it, because, while one consumer might require a little more than holder pressure, another might grumble that this was more than enough; and while there were not many wet meters in use in some towns, in others there were still a considerable number, and with them a pressure of more than 3 inches required to be dealt with.

Mr. J. Dickson (Forfar) had no doubt the time was coming when high pressure would take a much larger place in the sale of gas than it had done. It would seem as if the outside man was now coming into his own. The paper showed the need there was for seeing that things were well looked after outside. He had had very little to do with high pressure. He had put in a plant, but did not stay to see how it worked. In laying these pipes, was there any difficulty with them fracturing at bends? All incandescent gas-burners which were being sent out were not giving anything like the efficiency they should give; but if they had a uniform pressure in the outlying districts, such as was suggested in the paper, the efficiency of these burners would be

considerably increased, and complaints would be very much on the decrease.

Mr. YUILL felt somewhat in the position of the proud father over his son who had begun to take his place in the world. Mr. Mitchell had made a creditable appearance. It was interesting to note that the consumption of gas in one hour during the day in summer exceeded the consumption in the corresponding hour in winter. This was entirely due to the consumption of gas for cooking, because in summer not much was required for heating, and in winter there would be coal-fires in the houses. Some had no doubt experienced difficulties in dealing with the pulsation of the gas at the outlet of the exhausters used for boosting or raising the pressure. He gave this matter some little study; and knowing the part which the silencer on motor cars played, he introduced the same form in this baffle-tank. The arrangement was nothing more or less than that in the 6-inch pipe they drilled hundreds of small holes, in the aggregate equal to the area of the 6-inch pipe; and they knew that if they allowed high-pressure gas to pass through small apertures into a large reservoir, they at once took away any pulsation. He was glad to say that, in doing this, they had got rid of all pulsation. The gas as it issued from the baffle-tank was as steady as it possibly could be, and put no strain on the governors. In considering the question of size of exhausters required, they had necessarily to take into account the approximate quantity of gas that would be required. Even in dealing with the size of exhausters for ordinary use in gas-works, he had always made it a point to specify exhausters to pass a given quantity of gas at a certain number of revolutions per minute, against a head of 30 inches and a vacuum of 3 inches. In this case, they specified a pressure-raiser to deal with a certain quantity of gas. They could have got one engine and exhauster to do what they required; but they found it more advantageous to have two exhausters to do the work. Practically, there was less oscillation with two exhausters than there was with one. He believed the time was coming when they would have to supply consumers with gas at high pressure. This did not present to him the difficulties which some imagined. They would not require to supply a governor to each consumer, because meters were now being made which registered gas at high pressure. They would have to be particular to see that, no matter what the pressure might be—suppose it were only 20-10ths—they must give it constantly and steadily. If they were dealing with gas at 20-10ths, they might get a light equal to 20 candles per cubic foot; but if they introduced high pressure, in the newest form, they would be able to get an efficiency of 50 candles per cubic foot—a difference of 30 candles. Consumers, he thought, ought to avail themselves of this high efficiency. If they were able to offer consumers this high efficiency, possibly they were rendering it easier for the consumers to take part of it.

The PRESIDENT wished to add his thanks to Mr. Mitchell for his practical paper. The question of pressure was one which interested them all, and at no time more so than at the present. The system of lighting with incandescent burners required that a pressure of at least 25-10ths should be at the consumers' demand; and not only so, but when they remembered that the efficiency of the incandescent burner depended on the careful adjustment of gas and air, the value of a constant pressure must be evident to them all. The fear of raising the percentage of unaccounted-for gas had kept back many an engineer from giving increased pressure; but where increased pressures had been the rule, there had been no appreciable rise in the percentage of unaccounted-for gas. Under present-day conditions, the gas engineer had no choice. The wants of the consumer must be studied, and everything done to give satisfaction. The system of distribution described by Mr. Mitchell appeared at first sight a little complicated, but, what was most important, it seemed to be very efficient; and they were indebted to him for the description of it. He asked them to award Mr. Mitchell a hearty vote of thanks for his paper, and for the diagrams he had laid before them.

The HON. SECRETARY (Mr. W. Geddes) proposed a vote of thanks to the Directors of the College for the use of the lecture room they had been privileged to meet in.

The members were entertained at tea in Lamb's Hotel; and later a number of them visited the Central Swimming Baths, to inspect an installation of the Selas system of lighting which has been introduced there, and were loud in their praise of the wonderful lighting effect produced; three gas-lamps being found to light one large apartment almost as brilliantly as another apartment was lighted by 27 electric lamps.

Lectures on Illumination.—A special course of six lectures on "Illumination" will be delivered by Mr. J. S. Dow, B.Sc., at the Westminster Technical Institute of the London County Council, Vincent Square, S.W., on Friday evenings, at 7.30 p.m.; the first to be given on Friday next. Mr. Dow will deal with the recent developments and uses of gas, electricity, oil, acetylene, petrol-air gas, &c., in lighting; daylight and artificial illumination of interiors; the practical measurement of light and illumination; lighting specifications; hygienic aspects of lighting, and the effect of light on the eye; the use of globes and reflectors; illumination of streets, factories, shops, schools, &c.; and practical lighting problems. The lectures will be illustrated by experiments and lantern slides. The fee for the course is 2s. 6d.; but students already in attendance at the Institute will be admitted free.

LEGAL INTELLIGENCE.

MALTON GAS-WORKS ASSESSMENT APPEAL.

At the North Riding Quarter Sessions at Northallerton last Thursday, before Mr. W. BROWN and a Bench of Magistrates, an appeal was opened by the Malton Gas Company against the rating of their works by the Assessment Committee of the Malton Union. It was in respect of a rate made on Oct. 30, 1909.

Mr. MORTIMER, in opening the case, said the Company first started as a private concern in 1836; and it was incorporated by Act of Parliament in 1880. The question of the rating of so much of their undertaking as was in Norton was not directly in issue, because notices of appeal in regard to this portion of the property had been made to the East Riding. For the purposes of the hearing, however, the whole of the figures would be put before the Court; and it had been agreed that the accounts for 1909 should be taken as a basis. The works were wholly in Malton; and in Norton there were mains and public lamps. The land upon which the premises were situated extended to 8434 square yards. The ordinary share capital, which was now in £10 shares all paid up, was £24,000. There was also £5000 of loan capital on 4 per cent. mortgage bonds. Under the Act, there was a sliding-scale of dividend and price. When the dividend paid was 10 per cent., the charge would be 4s. per 1000 cubic feet; but as the price fell 1d. per 1000 feet, the dividend might rise in proportion. The price now chargeable was 2s. 6d.; and so the Company were entitled to pay 14½ per cent. if they could earn it. In fact, a steady dividend of 12 per cent., free of income-tax, had been paid. An important change affecting the position of the Company occurred in 1904, when electric lighting was introduced in Malton. In that year, the Northern Counties Electricity Company received from the Malton District Council the contract for the public lighting of the town by electricity. Up to that time the Gas Company had a sure customer in the District Council, who paid them for public lighting £400 a year. By their action, the appellants lost this amount; and from 1904 onwards they were face to face with the competition of the Electricity Company, who, having got into the field with their public contract, were enabled to harry, in a business sense, the Gas Company in relation to their private customers. In arriving at a fair rate, the question of the incursion of the Electricity Company was a most material point. In fact, the Gas Company had lost customers to the extent of a million cubic feet of gas a year on public grounds, and 4 millions so far as private customers were concerned. Apart from this loss, there was inevitably forced upon the appellants a very material change in the method of conducting their business. In face of the electric lighting competition, the Company were forced to press prepayment gas-meters upon their customers. This change in the policy of the appellants had had the result of increasing very largely indeed the amount of capital which a hypothetical tenant must put into the business. If they were looking for such a tenant, and were trying to arrive at a rent which he must pay, one of the most important factors to consider was what capital he must risk in order to carry on a business in which he was prepared to engage. The point was that, owing to the change, though it might be that the profits of the Company would go on increasing, the assessable value of the property for rating purposes did not increase. The tenant was risking more capital, and he was entitled to a larger share of profits; and therefore there was a smaller share of profits assessable. In 1909, the Company began to consider the question of their assessment, and of the rate made upon it. They found that the sale of gas had been almost stationary for the previous six years, and that, in face of the increasing competition of the Electricity Company, the prospects of augmenting their sales in future were, to put it mildly, gloomy. On March 30, 1909, they gave notice of objection to the valuation, no alteration in which had been made since 1894. After that year, the price of gas had been reduced from 3s. to 2s. 6d. per 1000 cubic feet; the price of coal had increased by 14 per cent.; the public lighting contract had been lost; and small consumers had taken the place of large ones. On Sept. 11, 1909, the Assessment Committee adopted a revised assessment, more favourable to the Company; and having it, they hardly expected to receive on Oct. 20—barely six weeks later—a new assessment putting them into a far worse position than they were in in 1894. In that year, the works at Malton were assessed at £929 gross and £651 rateable, and the mains, &c., at Norton at £81 gross and £57 rateable—making a total of £1010 gross and £708 rateable. The revised estimate in September, 1909, was: Works at Malton, £922 gross and £493 rateable; works at Norton, £81 gross and £57 rateable—making a total of £1003 gross and £550 rateable. On Oct. 20, the Malton works were assessed at £1516 gross and £739 rateable, and the mains, &c., at Norton at £167 gross and £107 rateable—making a total of £1683 gross and £846 rateable. The rate was laid in accordance with this assessment; and it was the subject of the appeal.

Mr. *G. H. Davies* was then called, and said he estimated that the proper rateable value of the whole of the Gas Company's undertaking both at Malton and at Norton as it now stood was £490.

On the conclusion of the case for the appellants, the Bench retired for a few minutes; it being intimated that the Chairman was indisposed. It was subsequently announced that Mr. Brown was too unwell to return to Court, and, with the consent of both parties, the Sessions were adjourned to the 30th inst.

Electric Light Failure during Examinations.—Great inconvenience was caused on Friday afternoon by the failure of the supply of electricity in the rooms of the Examination Hall of the Royal Colleges of Physicians and Surgeons on the Victoria Embankment. Examinations in several subjects were in progress; and all came to a stop with one exception—viz., the examination in practical physics, in connection with which there was a supply of wax candles for optical experiments. These were at once distributed and brought into use. After half-an-hour, the electric light was restored.

MISCELLANEOUS NEWS.

KIRKCALDY GAS-WORKS PURCHASE ARBITRATION.

The Proceedings Opened in Edinburgh.

Yesterday, an arbitration to determine the price to be paid by the Corporation of Kirkcaldy for the transfer of the undertaking of the Kirkcaldy Gaslight Company, Limited, was opened in the North British Station Hotel, Edinburgh.

The Arbiters are: For the Company, Mr. CORBET WOODALL; and for the Corporation, Mr. ARTHUR SILVERTHORNE. They have nominated Lord SHAW OF DUNFERMLINE as Oversman. The Company were represented by Mr. MURRAY, K.C., and Mr. MONCRIEFF (instructed by Messrs. Martin and Co., of London, and Messrs. Adamson, Gulland, and Stuart, of Edinburgh); and the Corporation by Mr. CLYDE, K.C., M.P., and Mr. MACMILLAN (instructed by Messrs. Morton, Smart, MacDonald, and Prosser, of Edinburgh). The leading witnesses for the Company are Messrs. E. H. STEVENSON, H. WOODALL, HENRY O'CONNOR, and ADAM MACPHERSON. On other side are Messrs. CHARLES HUNT, W. R. HERRING, and R. COCKBURN MILLAR, of Edinburgh. The first witness called for the Company was Mr. WILLIAM CASH, of London.

The claim of the Company is for £224,000, "as consideration for their undertaking, and the right, power, privileges, and all the lands, premises, works, and other property of the Company, all within the meaning and interpretation of the Burghs Gas Supply (Scotland) Act, 1876. The Company contend that the purchase does not include money in the bank, outstanding debts, stocks of coal, stocks of gas, or any other such movable assets, and that it is beyond the competence of the arbitration tribunal to deal with the money in bank, outstanding debts, stocks of coal or gas, or any other such movable assets. The Company also contend that the purchase has been made subject to the pension payable to the late Manager—being £260, consisting of £225 for each pension with £35 as the commuted value of free gas, which falls to be taken over and paid by the Corporation—and also that the Corporation shall take over the contracts for the purchase of coal and the sale of residual products. The Company contend that the date of vesting does not arrive until the consideration has been fixed, and until the Corporation are ready to pay, and do pay, the consideration. It is further contended that the Corporation, on their adoption of the Burghs Gas Supply Act, on Jan. 19, 1910, and on the Company's intimation, on Feb. 19, of willingness to sell, would have been entitled to start rival gas-works, and that the Company were thus compelled to sell their undertaking to the Corporation.

In reply, the Corporation state that the intimation by the Company on Feb. 19 was an exercise by them of their statutory option of compelling the Corporation to buy, and that the contract of sale and purchase thereby constituted took effect as from Feb. 19. The property agreed to be acquired comprises all the assets mentioned by the Company as not included in the purchase. It is denied that the purchase has been made subject to any pension payable to the late Manager; and there is no statutory or other legal warrant for imposing liability for any pension on the purchasers. The Corporation admit their liability to take over contracts for the purchase of coal and the sale of residual products. It is contended that since Feb. 19 of last year the undertaking has been carried on on behalf of the Corporation. The sum claimed is said to be greatly in excess of the value of the undertaking.

It is set forth that in 1845 a Provisional Committee was formed in Kirkcaldy, for the promotion of a rival gas company to that of the claimants; but that the claimants then entered into an agreement as to the restriction of their dividend to 7½ per cent., the formation of a sinking fund, and other matters, and the threatened opposition was withdrawn. The Corporation say that the agreement of 1845 is still in existence; and that it has all along been regarded by the Company as binding upon them—parts of the agreement having, it is asserted, been adopted by the Company. The Company assert that any agreement made in 1845 has long since fallen under the long negative prescription contained in the three Scotch Acts, 1465, 1474, and 1617, the first of which provides that "in time to cum, all obligations made and to be made that he is not followed within forty years shall prescrive and be of nane avail." The Corporation, it is maintained, were not parties to the agreement of 1845; and in any event, they are barred by acquiescence and delay from now maintaining that agreement. There are allegations that the capital of the Company, which was fixed at £4000 when the Company was originated in 1830, has been several times irregularly inflated, till it now stands at £65,335. Of this sum, more than half—£33,332—it is contended, is inflation. The Company deny this statement, but admit that on several occasions surplus funds belonging to the shareholders were capitalized, which, it is said, is nothing unusual or improper. Their capital is far from being inflated, and, as will be proved, does not really represent the Company's fixed assets. As the result of the breach by the Company of the agreement of 1845, there have been paid to the shareholders of the Company, by way of dividend, sums in excess of what was permissible, amounting, up to and including the financial year of the Company ending May 31, 1909, to £49,278. This is denied by the Company, who say that they could only have paid larger dividends to their shareholders by charging higher prices for gas than should have been charged, and the proper persons to complain of that, and to recover any over-payments, were the consumers of gas and not the Corporation. It is maintained that without parliamentary authority the Company could not have continued in business, and that it could not have obtained parliamentary authority in disregard of the agreement of 1845. This is denied by the Company. The Corporation maintain that the Company have exceeded their constitution by engaging in the business of selling and supplying gas-cookers and other apparatus. To this the Company reply that they sell only one quality of gas—illuminating gas. Cookers and appliances have been sold by the Company at a small profit; but the profit has not, as a matter of fact, been included in the Company's revenue.

BUCKS AND OXON GAS COMPANY, LIMITED.

Liquidation Proceedings.

First meetings of creditors and shareholders in the Bucks and Oxon District Gas and Coke Company, Limited, were held at the London Bankruptcy Court last Tuesday.

The OFFICIAL RECEIVER (Mr. Burgess), addressing the creditors' meeting, said the Company was promoted in 1907, nominally by the Finance and Construction Company, Limited; but actually the entire conception was that of Mr. E. O. Preston, who was the controlling man in the Company. His idea was to buy up gas-works in certain localities in Buckinghamshire and Oxfordshire, and see whether he could not, by combining them, economize labour, and so supply gas at a cheaper rate than before. There were altogether six places in which there were to be gas-works; the first three being Adderbury, Deddington, and Blexham. As regards the two latter, they were so small that it was considered great economy would be effected if Adderbury were connected by mains with the other two places, and the three districts supplied from one centre at Adderbury instead of having separate works at each. It was subsequently contemplated to take over some old-established works at Buckingham; and later on at Cricklade and Woodford. Arrangements were made by Mr. Preston with the existing owners of these concerns, whereby his Company bought them and resold them to the Gas Company. Of course, the resale was to be effected at a profit; but the actual amount that Mr. Preston or the Finance Company made it was almost impossible to ascertain, because the properties bought were not merely passed on to the Gas Company. The Finance Company first undertook to, and did actually, carry out a reconstruction of the premises, extension of mains, &c., and in some cases built new works, before handing the concerns over. There were two agreements entered into between the Gas Company and the Finance Company. In the case of Bloxham and Deddington, the Gas Company bought direct from the Liquidators of these concerns. They paid for the Bloxham undertaking £2700, and for the Deddington one £2800, in each case in debentures and shares. He did not think the works were ever worth these amounts. Another agreement was entered into between the promoters and the Finance Company which provided that the Gas Company should purchase a freehold site at Adderbury and gas-works at Buckingham, and that the Finance Company should link-up Adderbury with Bloxham and Deddington, and rebuild and extend the Buckingham works and mains. The consideration to be paid for the Adderbury and Buckingham undertakings, including all the expenses of construction, &c., was £29,000, payable as regards £19,500 in debentures, and the remainder in shares. In the case of each of the purchases by the Gas Company, the Directors fortified themselves in agreeing to the price by the idea that the improvements made were going to make the concerns pay, and by the reports of Mr. A. T. Painter. He, however, was really a person who had been frequently employed by Mr. Preston to make valuations for him in other cases; and he (the Official Receiver) did not think for a moment Mr. Painter could have been expected to give a valuation suitable for the purposes of the Gas Company. There was another matter in connection with the promotion which, although no mischief appeared to have arisen from it, was to be considered. Mr. Preston or the Finance Company, before actually agreeing to the figure at which he was to purchase these old concerns and pass them on to the Gas Company, bought up all the shares from local holders; and when they had been purchased, he (the Official Receiver) believed Mr. Preston used to appoint his own liquidator to wind-up the undertakings. This might lead to something very mischievous, as it would be easy for Mr. Preston to swell up the price to the liquidator; and it would then be very difficult to say he had actually made anything out of the promotion. The other two gas-works acquired by the Gas Company were at Cricklade and Woodford, and were purchased for £12,000 and £15,000 respectively. The agreement with regard to Cricklade was entered into with the Finance Company on Aug. 6, 1908; and under it the Gas Company acquired the premises of the Cricklade Company. The Finance Company undertook to extend the works and put in new mains. They had paid £5000 for the old concern; and here, again, considering the money they had to expend in the direction named, it was impossible to say that the £7000 extra for the resale to the Gas Company was an improper profit. The Woodford business was acquired in January, 1909. Freehold land was purchased by the Finance Company, who erected gas-works, and sold the concern to the Bucks and Oxon Company for £10,000 in debentures and £5000 in shares. As in the case of the former undertakings, Mr. Painter advised as to the proper price to be paid. In regard to the debentures, there ought to have been issued, under the terms of the contracts, 41,175 in all; but, by some oversight which he could not explain, only 37,500 had been actually issued—leaving 3675. There were also 12,075 shares unissued. The effect of this would be that if it were suggested that the purchase-money the Company had to pay was too large, it could be argued that they had not paid it all. There were these 15,700 debentures and shares outstanding, and representing part of the purchase-money that had not been paid—in fact, it represented a quarter of the total purchase-money. He could not find that the business from the old works had increased much since the Gas Company acquired them. The returns were very small. He had the figures for the quarter ended Sept. 30 last, though this was not a good one to take as an example. The Buckingham works showed total receipts amounting to £437, and a profit of £144 for the quarter, exclusive of the Directors' fees. For Adderbury, the profit for the quarter was £8 6s.; at Cricklade, it was £16; while Woodford showed a loss of £25. This was the secret of the whole thing. These were small concerns, and were never worth taking up by a Company like the one he was dealing with. The Directors said the undertaking had not been a success because they never had any money with which to carry on the business. Only £350 in shares was subscribed by the Directors and friends; and there had never been any issue to the public. They laid some additional mains; but this was expensive work, and in outlying country districts they sometimes had to put down a main of considerable length for one or two customers. At all events, there had not been the extension the

promoters thought there would be; and it seemed to him a foregone conclusion that the concern must come to an end in that Court. He had had a report from Mr. Frank H. Jones, M.Inst.C.E., who valued the whole undertaking at £18,000. The debenture claims amounted to £37,000; so that this would allow 10s. in the pound to the debenture-holders, and, of course, there could be nothing for the creditors.

Mr. WHITE (Receiver for the Debenture-holders) pointed out that there were £4000 of first debentures in respect to the Buckingham works. When the Company bought these works, it was agreed that £4000 was to be charged separately on them, and the remainder of the purchase debentures divided over the whole of the Companies' concerns.

The OFFICIAL RECEIVER said this meant that, after paying the £4000 on the prior claim, they had to raise £33,000 to meet the other debentures; and the whole of the property was valued at £18,000 if it could be sold as a going concern. The statement of affairs as presented by the Directors and Secretary valued the assets at £45,000. He had read Mr. Jones's report very carefully, and he did not believe in the figures put forward in the Directors' statement. He thought Mr. Jones's valuation of £18,000 much nearer the mark; and he advised the debenture-holders not to base their hopes on the other estimate. The assets, besides the business itself, were put as follows: Trade fixtures, £3500; stock-in-trade and cash in hand, £138; book debts, £580. There were unsecured creditors for £21,249; but the debenture-holders must not be misled by this item, because a great deal of it was in respect of the unpaid portion of the purchase-money, £12,900 of which was outstanding, while there was an item of £4265 as cash advances by Mr. Preston. The other claims were in respect of meters supplied, £2300; coal, £1100; and goods supplied and bank overdraft, £3000.

Mr. MOORE, who said his own loss in the Company, as an unsecured creditor, would amount to £800, advised the creditors to leave the matter in the hands of Mr. White, as they could not get a penny. He went on to denounce in emphatic terms the action of the promoters. He suggested that shareholders should wash their hands of the whole business.

Mr. WHITE said he supposed, as there was no resolution, the matter would remain in the hands of the Official Receiver.

The OFFICIAL RECEIVER said he could act with Mr. White, as there was no need for the shareholders to be represented, seeing that the debenture-holders held a charge over all the property. Mr. White would have to realize the assets and report to him. He did not think it would be profitable to go into the question of any improper profits being made on the part of the promoters, so far as the creditors were concerned, because they would have to pay for the investigation, and any money that might accrue out of it would go to the debenture-holders. Mr. Preston was really the promoter; and as he was a bankrupt, there was not much object in pressing any claim against him. The Finance Company were also in liquidation; and so it was useless to pursue them. But if any creditor suggested anything improper as to the conduct of those concerned with the Company, it would be his (the speaker's) duty to go into it.

Mr. WHITE, in reply to a question, said he intended to call a first meeting of debenture-holders to consider what they should do with the business. It would be composed of only the larger holders (£500); and these would make a recommendation to the general body. The idea at present was that the debenture-holders should take over the concern, and run it in future; accepting, in exchange for the present debentures, a smaller proportion in accordance with the value of the estate. The difficulty was that the debenture-holders for the £4000 charge on the Buckingham works would not agree. It was proposed, therefore, to try to raise £4000 on a debenture over the whole works, for the purpose of paying off the prior claim.

It was agreed that the Official Receiver should act as Liquidator; and this was confirmed at a subsequent meeting of shareholders, which was quite formal.

CO-OPERATIVE LIGHTING BY TRADESMEN.

A Story with Two Sides from Bromley.

It is frequently found that there are two sides to a story—especially to electrical stories. One, with two sides, comes from Bromley; and its best side can be claimed by gas, through the enterprise of certain local tradesmen, acting in co-operation with the Bromley and Crays Gas Company.

The first instalment of the tale was given recently in the "Electrical Review." It was as follows:

> An interesting development of street lighting by arc lamps is just being started at Bromley (Kent). Both gas and electricity supply are owned by Companies, and the District Council of Bromley has a long-term contract for the lighting of the streets by gas. Tradesmen in the High Street are naturally dissatisfied with the gas lighting; and as they cannot get any improvement through their representatives, they have simply taken the matter into their own hands, and have arranged with the Electric Light Company for the street to be illuminated by arc lamps. A Committee of Tradesmen has been formed, and permission to suspend the wires from rosettes on the buildings on either side has readily been given by the various property-owners, the Council giving the necessary consent. Each tradesman pays a proportion towards the initial cost, and afterwards for the energy to run the lamps, the amount that each has to contribute being apportioned by the Committee. It is not often that one hears of such a collective arrangement amongst tradespeople; but it is clearly a very sensible move. We commend it to other communities, where, on account of vested and other interests, the street gas lighting cannot either be improved or superseded.

There is a good deal of the good old brand of electrical colouring about the foregoing. The facts are these: There has never been any claim for more public light. The High Street is well lighted by means of "Whitehall" gas-lamps, fitted with 200-candle power burners. But certain tradesmen felt that the trade at their end of the town was showing a tendency to ramble to the other end; and with an idea of stemming this departure, one or two tradesmen conceived the idea that a few electric arc lamps of high candle power would bring all things right again. Needless to say, the management of the Electricity Supply Company carefully fostered the idea, and agreed—we understand, for a mere song—to fix nine arc lamps, strung across the narrow High Street on wires. The Town Council reluctantly gave their consent to the tradesmen fixing these lamps—reluctantly because they realized the great danger in such a situation in the event of fire of wires across the street from building to building. The lamps are fixed; and it is hoped the people who have to pay for them are satisfied. The scheme is the laughing-stock of the people at the other end of the town, and an object for the ridicule of many others. The lamps light the upper bedrooms of the premises on both sides of the narrow street, except when any of them happen to be out.

The people at the other end of the town not to be outdone consulted Mr. W. Woodward, Chief Engineer of the Gas Company; and he propounded a scheme which, after much opposition (no doubt inspired) in the Council, was allowed after much delay to be carried out in a modified form. The portion of the High Street in which the new gas lighting is installed presents difficult conditions for obtaining effect. It has shops only on one side; and the distance from building to building is about 85 feet. The portion of the street where the suspended electric lamps are measures about 40 feet from building to building, However, one result is a brilliant success; another that the tradespeople paying for electricity are very sick now that they have seen what the new gas-lamps can do. But let us have the views of the "Bromley and District Times" on the subject. That paper last Friday said:

> A fortnight ago reference was made in our columns to the improvement in the illumination of the Broadway, Bromley, by means of the standard gas-lamps, which had been installed there through the enterprise of the tradesmen in that part of the town, who are bearing the cost of the installation and of the increased consumption of gas. Mr. William Woodward, Chief Engineer to the Bromley and Crays Gas Company, has been good enough to tell us this week how the gas is supplied, and how the high pressure is obtained, together with what the lighting capacity of the lamps is and the gas consumption. The Gas Company laid a high-pressure main, 4 inches diameter, constructed of Mannesmann solid drawn steel tubes, coated with jute and asphalte. The main is supplied with the augmented pressure from a small compressor driven by a gas-engine, situated at the Company's offices in the High Street. The ordinary pressure in the general gas canalization is equal to a column of water of 4 inches. But by means of the compressor, the pressure is increased to equal a water column of over 54 inches, and a lighting efficiency of about 60 candles is obtained per cubic foot of gas consumed. Altogether there are fourteen lamps, not twenty, as was originally proposed—the Town Council insisting on their being placed 50 feet apart instead of 40 feet—the distance suggested. The lamps—erected on the Gas Company's ordinary standards slightly lengthened—give 1500-candle power. They are of the Keith pattern, and are similar to those used in Piccadilly and Regent Street. Each lamp consumes about 25 cubic feet of gas per hour. The Bromley and Crays Company have a reputation for promptitude, which has been splendidly upheld by the way in which this contract was dealt with; and it is a matter for admiration, as well as congratulation, that they could commence and complete an order of the dimensions which the work implies in such a short period as ten days. Now the compressor is installed, other tradesmen can be supplied with lamps of similar capacity to those on the Broadway; and we should think the example will be followed. This special lighting is a distinct asset to the town; and if the tradesmen on the Broadway were now to arrange a scheme of illumination of their shop windows so that there was an equality of power (not of style) at each, the effect, in combination with the newly-erected gas-lamps, would be enormously increased, and very fine indeed.

HASTINGS CORPORATION AND THE GAS-BURNER BILL.

Costs of Opposition.

At the Meeting of the Hastings Town Council on Friday, the Public Lighting Committee reported that the expenses incurred by the Council in relation to the opposition to the Gas Companies (Standard Burner) No. 1 Bill, apart from the proportion of the expenses of the combined opposition of local authorities, the accounts for which were passed at the meeting of the Council on the 4th of November last, have been taxed by one of the House of Commons Taxing Masters, and allowed at £184 1s. 3d., the sum of £5 3s. being allowed in addition for costs and fees in respect of the taxation; making a total of £189 4s. 3d. The Committee ordered a cheque to be drawn for the amount of the Town Clerk's Parliamentary Agent's charges and disbursement as taxed—viz., £178 13s.

The adoption of the report having been moved and seconded, Alderman Chesterfield said the greater part of the cost was incurred without the knowledge of anyone, even of the Town Clerk. He suggested that the town should change its Parliamentary Agents. Alderman Weston said the Council passed a resolution to oppose the No. 1 Bill, and, of course, they must have Parliamentary Agents, and they knew that the opposition would cost something. Alderman Chesterfield argued that the cost was not that of "recognized opposition." The Town Clerk (Mr. B. F. Meadows) said it was not that these matters were going on without his knowledge; it was mainly because the combined opposition took a totally different turn from what was expected. Of course, the Parliamentary Agents were not doing a lot of work without his knowledge or the knowledge of the Corporation. The report was adopted.

Dollar Gas for Montreal.—As from next May, the price of gas at Montreal is to be reduced to $1 per 1000 cubic feet. The present rate is $1·20, less 15 c. for prompt payment, or the same price as is charged for gas used for fuel. After the date named, there will be a uniform charge.

PUBLIC LIGHTING OF PADDINGTON.

Question Still in Abeyance.

The Paddington Borough Council last Tuesday had under consideration for the fifth time the question of lighting the public thoroughfares, on the adjourned report of the General Purposes Committee recommending the acceptance of the terms of the Gaslight and Coke Company for lighting the streets by means of the new inverted low-pressure burners. The question has been adjourned from time to time since July last year; and it has been recommended, after much consideration, on three occasions by the Finance Committee and the Works Committee, and twice by the General Purposes Committee—it having been referred to the last-named Committee, as readers may remember, only on a technical point arising on the Standing Orders. At the last meeting of the Council before the holidays, the General Purposes Committee reported in favour of the Gas Company's proposals; but, owing to the heavy condition of the *agenda*, the question was not reached in time, and consequently stood over. Last Tuesday, however, it occupied first place in the paper of business, and was again recommended for acceptance. But just as the discussion was about to take place, the Chairman of the Committee (Mr. E. S. M. Perowne) produced a letter that had been addressed to him by the Metropolitan Electric Supply Company—the result of negotiations between the Company and himself since the previous meeting—in which they sought to amend their offer. They pleaded that they had not had time to go into the matter thoroughly; and they now found that they could effect a saving to the Council of £1000 per annum on the lighting if certain suggestions which they proposed could be carried out.

On the question of adopting the Committee's report being put, Mr. Perowne asked that he might be allowed to read a letter he had received from the Electric Supply Company, which had been addressed to him at his private residence. Strong objection was taken by Mr. Waycott, who protested against a letter which was addressed to a member's private house being read. Having, however, obtained permission to read the letter and make an explanation as to how it came to be sent to him privately, Mr. Perowne stated that shortly before Christmas he was communicated with by telephone by the Electric Supply Company, who stated, with regard to the adjourned report, that they would like to revise their figures and make a suggestion, as, owing to their not having been before the Committee and want of time, they had been unable to state their case as they would have wished. They said they were satisfied that electric lighting would be cheaper than gas, and they would like to go into the matter. He asked their representative to come round and talk the matter over with him on the Bank Holiday (Dec. 27), and he did so. He (Mr. Perowne) asked the representative to put the matter into writing, and address the letter to his (the speaker's) private residence, and said he would bring it before the Council at the next meeting, when the report of his Committee would be before them. The plan for saving £1000 per annum was by a proposal that the borough should be divided into two districts—the Electric Supply Company taking the southern half, and the Gas Company the northern half. [Needless to say, this proposal, when read to the Council, was greeted with many loud cries of "Oh."] Mr. Perowne said that between the 27th of December and the 3rd of January he had not had any time to call his Committee (who were in favour of the Gas Company's proposals) together; nor was there any evidence that the Gas Company were asked whether, under the circumstances, they would like to amend their terms. This was his explanation, and also his reason for bringing the letter before the Council. Though he was in favour of electric light as against gas for public lighting, yet he claimed that he had acted in a perfectly honest and straightforward manner in the step he had taken.

After hearing the Chairman's explanation, Mr. Waycott was more strongly opposed than ever to the letter being read; saying he was against such methods as talks on the telephone, private meetings, and having proposals sent to a private address. Such communications should be sent to the Town Clerk officially.

A lengthy discussion ensued, in which it was suggested by a member that a Ward Committee should be appointed to take the opinion of the ratepayers, so that they should decide which streets they would like to have lighted by gas and which by electricity. Fortunately, however, no proposer was found for this ludicrous suggestion; and it fell to the ground.

Alderman Williams then moved that the letter become the property of the Council, and that it be sent to the General Purposes Committee to consider; also that the report be referred back. This was carried. Once again the matter goes back to the Committee who favourably recommend the Gas Company's proposals, and have given their figures, which have become public property, for the oft-repeated reason that the Electric Supply Company find they would like to give "new terms."

GAS AND ELECTRIC LIGHTING IN ISLINGTON.

Mr. Goodenough Deals with Alderman Vorley's Comparisons.

In the "Electricity Supply Memoranda" in the "JOURNAL" for the 20th ult., reference was made to some comparisons by Alderman Vorley, the Chairman of the Lighting Committee of the Islington Borough Council (who, it appears, have now tendered their resignation in a body), on the relative costs of gas and electricity for public lighting. The matter was noticed in the "Municipal Journal," with the remark that the worthy Alderman's statements would doubtless be challenged by the Gas Company concerned—viz., the Gaslight and Coke Company. Our contemporary was so interested in the question, that a representative called upon Mr. F. W. Goodenough, the Controller of the Sales Department of the Company, and obtained from him the following criticisms of the Islington figures.

Alderman Vorley makes the mistake, first of all, of comparing dissimilars. He compares large-unit electric lights with small-unit gas lights. . . . But the fact is that the illuminating power of the Islington arc lamps has been seriously over-estimated, and that of the gas-lamps seriously under-estimated. The Electric Department credit their flame arc lamps with 3500-candle power each. Actual tests show these to average less than 1200-candle power. The ordinary carbon arcs are credited with 800-candle power each. Actual tests show these to average less than 300-candle power. The gas-lamps (old type) are credited with 45-candle power. Actual tests show these to average over 60-candle power. Modern inverted burner lamps as now fixed on trial in Islington average over 85-candle power for a less consumption of gas. Correct for these inaccuracies, and a rather different complexion is put upon the matter.

But, apart from these questions of relative candle power, I think that Alderman Vorley has not quite realized the logical conclusion of his figures. One is, of course, that the streets containing these poor, feeble gas-lamps—which have never given anything but satisfaction to the inhabitants of the borough, judging by the entire absence of complaints made by the Council to this Company—these streets, if Alderman Vorley is correct, are only lighted one twenty-fourth part as well as those favoured with arc lamps—his figures being 1900 candles per mile against 48,664 candles per mile. How has it been possible for the residents in the 1900-candle power per mile districts to have endured for all these years the indignity of being so treated in comparison with their neighbours in the 48,000-candle power per mile districts? Do the residents in the arc-lit streets endorse Alderman Vorley's contention as to the twenty-four fold superiority of that lighting over gas? Especially in times of fog or total failure of the electricity supply, do they appreciate the enormous superiority of arc lamps over the humble gas-lamp?

There is, however, a second logical conclusion to be drawn from Alderman Vorley's line of argument—viz., that electric lighting as in Islington at present is five times cheaper than the latest type of metallic filament electric lighting, assuming (as is claimed by some electricians who do not have to earn dividends for their undertakings) that lamps of equal candle power to the existing gas-lamps could be installed and run at equal cost. Therefore—electricity is cheaper than electricity! Therefore, also, the only logical thing for Islington to do (if they are going to act upon Alderman Vorley's figures) is to extend their arc lighting throughout the borough, and increase the cost of lighting the streets now lighted by gas from £13,112 a year to £63,440 a year by electricity.

But the Islington borough councillors might, before they take any step in the direction of a further extension of electric lighting, whether by arc or by filament lamps, consider the following facts: (1) That where—as in Westminster, and more recently in Paddington—the suppliers of the two illuminants have been invited to send in sealed tenders for equal candle power lamps, gas has proved the cheaper. (2) That 3000-candle power high-pressure gas-lamps have recently displaced 3000-candle power flame arc lamps in Regent Street, because our tender was substantially the lower. (3) That 1800-candle power high-pressure gas-lamps have recently displaced old pattern arc lamps in Piccadilly, St. James's Street, Pall Mall, Waterloo Place, Coventry Street, Charing Cross Road, and Shaftesbury Avenue, because the tender for gas was lower than that for similar power electric lamps. (4) That the tenders for lamps of equal candle power in Westminster compared as follows (*vide* report of Works Committee): Gas, £13,800 per annum; electricity, £21,800 per annum. This hardly looks as if, light for light, electricity is five times cheaper than gas, and I am indeed rather surprised to find anyone of Alderman Vorley's ability and reputation putting such a contention forward for serious consideration. Probably I am wrong in taking him seriously; but, you see, you and others have already done so.

"Then," said our contemporary's representative, "you are not afraid of losing the street lighting of Islington?"

"No," was the reply; "because I believe that the Islington borough councillors have the true interests of the ratepayers at heart, and will therefore give both illuminants 'a fair field and no favour,' in which case we know we shall win, because we can give the best value for money."

GAS MATTERS IN MANCHESTER.

At a Meeting last Wednesday of the Manchester City Council, several matters affecting the Gas Department came up for discussion.

Charge to Slot-Meter Users.

Mr. JENNISON moved: "That, in the opinion of the Council, the time has arrived when consumers of gas through penny-in-the-slot meters—being mostly the poorest of our citizens—shall receive equal consideration with those in more affluent circumstances, and have gas supplied to them at the same price as consumers through ordinary meters; and the Council instructs the Gas Committee to forthwith consider and report to the Council on this urgent and important matter at an early date." He contended that the Gas Committee were at the present time taking money out of the poor people's pockets, and putting it into the pockets of the rich people, who hardly burned a halfpenny worth of gas in the twelve months. The poverty of the poor people was the great cause of his bringing this resolution forward; and he thought they should be put on an equality with other people in the city. It was admitted they had reduced the illuminating power of gas by 4 candles; and this being so, he considered it was robbing these poor people under cover of the law. He would like to know how much of the capital of the Corporation was lying idle in stoves which were in houses and not used, how long they had been there, and the amount of gas consumed since they had been put in. He was afraid if this information was obtained, it would startle a great many of them. Gas was a domestic commodity which the city could not do without, unless they went back to ancient times; and it was as necessary for the poor people to have it as to have water. It was not fair that the wealthy people, many of whom burned so little, should be allowed to have gas at a considerably less price than those who used penny-in-the-slot meters. This question affected no less than 60,000 people in the city, and it deserved their most serious consideration.

Mr. JACKSON said the penny-in-the-slot meter user suffered an injustice, but only in common with the ordinary gas users; and the injustice was that they had to pay more for gas than it cost to produce.

The only remedy was that gas should be charged for at its cost price. As a step towards this, he supported the motion.

Alderman GIBSON, on behalf of the Committee, made a detailed statement of the relative numbers and position of the ordinary and automatic consumers of gas in Manchester. Of ordinary consumers, there were 117,000, and 61,000 automatic meter users. The gas consumed by the former in a year was 4,420,000,000 cubic feet; by the latter, 540,000,000 feet. The average amount of gas consumed by each ordinary user was 37,000 cubic feet; by each slot user, 9000 cubic feet. The total cost of distribution and management, including repairs, maintenance, renewals, salaries, and wages to both classes of users, amounted to 5¾d. per 1000 cubic feet to the ordinary meter, and 13d. for the slot meter. Hence, taking into account the cost at which gas was sold to both classes of users, slot consumers were getting gas at 2d. per 1000 feet less than users of ordinary meters. He cited figures relating to several other municipalities in the kingdom, where the difference between the cost of gas to the ordinary consumer and to the slot consumer was considerably greater than in Manchester. The slot customers in Manchester, he concluded, were treated much better than were similar users in most of the municipalities in His Majesty's dominions.

Mr. JENNISON observed that the Gas Committee could easily afford the small concession involved in his motion.

The resolution was lost by 40 votes to 38.

GAS PROFITS AND SMOKE.

Mr. JACKSON referred to the Manchester and Salford Sanitary Association deputation and the mitigation of the smoke nuisance, and to the contention that gas should be supplied at the lowest possible figure. He also mentioned the £50,000 contribution towards the city rate, and said the principle adopted was a wrong one—in fact, it was not sound finance. There was no relief from the increased price of gas. The rate was no less. He contended that a decrease in the price of gas would mean an increase in the consumption, and a reduction in the smoke pollution. He moved that the minutes be referred back.

Alderman PLUMMER seconded, but stated that, while the Gas Committee contributed some £50,000 a year to the rates, they had in return something like £65,000.

Mr. ROYSE said the time was not opportune to discuss the question.

Sir BOSDIN LEECH maintained that the contribution of £50,000 was all too little—in fact, the profits from the gas should not be considered as profits at all.

The LORD MAYOR (Mr. C. Behrens) said it was hardly a Committee question, and it should be properly considered by the Council. If necessary, he would call a special meeting to deal with it.

Alderman GIBSON entirely agreed with Mr. Jackson, but remarked that they could not discuss so great a question at an ordinary Council meeting. In his judgment—and he had thought a good deal about it for more than twenty years—there was only one solution to the question, and that was that every trading Committee of the Corporation should pay the same proportion towards the rates on its indebtedness.

Mr. JACKSON withdrew his amendment, and the matter dropped.

SALFORD GAS UNDERTAKING.

At last Wednesday's Meeting of the Salford Town Council, Mr. Purcell, one of the Labour members, moved a resolution to instruct the Gas and Finance Committee to issue a statement giving information on the following points: The number of dwelling-houses on which rates are paid direct by the occupier, and the rateable value of them; the number and rateable value of dwelling-houses upon which rates are not paid direct by the occupier; the number of slot-meters and the number of ordinary meters in each of these two classes of houses; and the total amounts paid by the gas undertaking to the borough redemption fund and the district fund. His object in moving this resolution was, he said, to make the information available to the public. He knew that to collect and tabulate the facts asked for would involve some expenditure of time and money; but he believed it was important that the Council and the ratepayers should be accurately informed on these matters.

The Mayor (Alderman Phillips) said that, in order to secure the information, it would be necessary to go through the whole of the rate-books for Salford and the out-districts which were supplied with gas. The Borough Treasurer had stated that the work would cost not less than £150.

In reply, Mr. Purcell remarked that he had not intended to include the out-districts within the scope of the inquiry; and he would amend the resolution so as to limit it to the borough.

After discussion, however, the motion was defeated by 20 votes to 18.

New Joint-Stock Companies Registered.—The West Cumberland Bye-Products Company, Limited, has been registered with a capital of £50,000, in £1 shares, to carry on at Flimby, in Cumberland, and elsewhere the business of chemical manufacturers, coalowners, gas and coke makers, tar producers and distillers, &c. The Thermotic Company, Limited, with a capital of £100, in £1 shares, has been formed to carry on the business of manufacturers of gas apparatus for heating, lighting, and otherwise. The Audlem Gas Company, Limited, has been registered with a capital of £100, in £1 shares, to supply gas at Audlem, in Cheshire.

Reductions in Price.—As from the 31st of March, the price of gas in the district of the Hornsey Gas Company will be 2s. 9d. instead of 2s. 11d. per 1000 cubic feet. The Worksop Gas Company have reduced their price as from the 1st inst. The former figure was 3s. 4d. per 1000 cubic feet. It is now 3s. 2d., with discounts of 2d., 3d., and 4d. according to the quantity consumed. The Lewes Gas Company announce a reduction in the price of gas to consumers by ordinary meters of 2d. per 1000 cubic feet as from March 25. The reduced price—viz., 3s. 6d.—will be the lowest yet touched in Lewes. There will be a corresponding reduction to consumers by slot-meters.

NEWCASTLE AND AUTOMATIC LIGHTING.

In our issue for the 27th ult. (p. 951), it was stated that the Lighting Committee of the Newcastle-upon-Tyne Corporation had decided to recommend the Council to adopt automatic extinguishing and lighting apparatus for street-lamps over the whole of the city, in sections; and that it was proposed to make 1000 installations at a time. We have now received from Mr. George Lamb, the Lamp Inspector, the following report on the subject of the automatic lighting and extinguishing of public lamps, which was submitted by him to the Chairman and members of the City Lighting Committee.

Before a general adoption of a pressure system can be wholly made, difficulties may be met with, as the gas-mains and branches must be in a thoroughly efficient condition, so as to offer as little resistance as possible to the wave in its travel throughout the hundreds of miles of mains and lamp-branches there are in the city. While difficulties have been encountered, they have been overcome in the course of the twelve months' experiment; and the Committee need have no doubt that the experiments carried out in Newcastle have demonstrated clearly the great possibilities underlying a pressure-wave system for the lighting and extinguishing of public gas-lamps. The three previous experiments with automatic lighters that have been made in Newcastle are as follows: Butcher pressure-wave patent, in 1885; Gunning clock apparatus, in 1903; Bamag pressure-wave patent, in 1907.

In accordance with a request of the City Lighting Committee, confirmed by the Watch Committee at their meeting held on July 16, 1909, Messrs. Alder and Mackay agreed to fix 250 of their apparatus on a twelve months' trial. Later on, a letter was received from the Gas Company urging upon the Committee the desirability of trials being made with one or more clockwork and Bamag pressure apparatus, in addition to the experiment with the Alder and Mackay apparatus. The Gas Company were informed, in reply, that the decision of the Committee to have an experimental trial of Alder and Mackay's controllers was arrived at after a careful consideration of the merits of the Bamag and the best clockwork apparatus; and in their opinion, it would be best to carry out the experiment as determined on. In the event of any failure, it would then be open to the Committee to try another apparatus. The Committee, however, stated that they would not offer any objection to the Gas Company carrying out trials of other systems for mechanically lighting and extinguishing public gas-lamps themselves. The Gas Company, therefore, on their own account, fixed 250 Bamag apparatus, commencing on the same date as the Alder and Mackay experiment, and 250 Horstmann clock apparatus, which were not ready for operating until February, 1910. Observations on the Bamag experiment are attached to this report.

The Committee's experiment with 250 of the Alder and Mackay apparatus commenced at lighting time on Nov. 8, 1909, and ended on the morning of Nov. 8, 1910, having extended over a period of 365 nights; and the results of the experiments are set out as follows:—

Sectional Division of the Mechanical Lighter.

Name.	Section.	Lamps Extinguished at		Total.
		Midnight.	Daybreak.	
Alder and Mackay .	A	122	128	250

Failures from All Causes.

Apparatus.	Experiment Commenced.	No. of Nights.	No. of Actuations.	Failures from All Causes.	Rate per Cent. of Failures on Actuations.	No. of Lamps Lighted.	Rate per Cent. of Failures on Lamps Lighted.
Alder and Mackay .	Nov. 8, 1909	365	273,750	853	0·31	91,250	0·90

The following table gives the description and number of failures at lighting and extinguishing times:—

Alder and Mackay Apparatus.	Bye-Pass.	Shortage of Pressure.	Service Choked.	Apparatus Out of Order.	Cocks Turned Off.	Irregular Operations.	Unknown Causes.	Total.
Failures at lighting time	287	..	158	25	21	48	21	560
Failures at morning extinguishing time	..	6	185	40	10	19	33	293
Total . . .	287	6	343	65	31	67	54	853
Rate per cent. of failures on 273,750 actuations . . .	0·10	..	0·120	0·023	0·011	0·024	0·019	..
Rate per cent. of failures on 91,250 lamps lighted. .	0·31	..	0·375	0·071	0·033	0·073	0·059	..

It will be seen from the above table that the failures due to defects in the apparatus only have been as follows:—

On actuations, 0·023 per 100 = 1 lamp per 4348.
On lamps lighted, 0·071 per 100 = 1 lamp per 1408.

BURNING HOURS.

The weather during the past twelve months has been such as to leave no doubt that the Committee's experiment has been carried out

under the most trying conditions. Notwithstanding this, there has been a saving in burning hours—an average of 939 hours 19 minutes per lamp. The schedule burning-hours for hand-lighted lamps in Newcastle is 3776 hours 35 minutes per annum; and with mechanical lighting, this has been reduced to 2855 hours 34 minutes.

The burning-hours saved have been as follows:—

Apparatus.	On Lamps Extinguished at				Total.		Average Saving per Lamp.	
	Midnight.		Daybreak.					
	Hours	Mins.	Hours	Mins.	Hours	Mins.	Hours	Mins.
Alder and Mackay .	1747	8	131	30	1878	38	939	19

The comparative cost of lighting and extinguishing public gas-lamps by hand and by the Alder and Mackay distance pressure-apparatus from Nov. 8, 1909, to Nov. 8, 1910, is as follows:—

Gas at 2s. 2d. per 1000 cubic feet, less 27½ per cent.
Consumption, 3¾ cubic feet per hour.

No. of all-night lamps	128
No. of evening lamps	122
Total	250

Burning Hours: 3776 hrs. 35 mins.	Per Lamp.	Burning-Hours: 2855 hrs. 34 mins.	Per Lamp.
Gas	£1 2 3	Gas, including bye-pass.	£0 19 7
Lamplighters', &c., wages	0 14 10	Attendants', &c., wages.	0 7 4
Repairs and renewals of mantles	0 4 5	Repairs	0 2 3
Mantles	0 1 11	Mantles	0 1 11
Uniforms and coke . .	0 0 5	Waterproofs, &c. . .	0 0 2
		Cost of operating wave .	0 3 0
		Total	1 14 3
		Balance in favour of mechanical lighting .	0 9 7
	£2 3 10		£2 3 10

Amount saved on gas for 250 lamps . . .	£33 6 8
Amount saved on maintenance for 250 lamps	86 9 2
Total	£119 15 10

The actual cost for operating the pressure wave is about £150 per annum, and would be the same if all the lamps in the city were operated with the wave.

The following is the note appended to the report.

OBSERVATIONS ON THE BAMAG APPARATUS.

The working cost and saving with the Bamag apparatus will, of course, give practically the same result as the Alder and Mackay apparatus.

The Newcastle and Gateshead Gas Company's Experiment with the Bamag Pressure-Wave Apparatus, from Nov. 9, 1909, until the morning of Nov. 8, 1910, a period of 365 nights.

Name.	Section.	Lamps Extinguished at		Total.
		Midnight.	Daybreak.	
Bamag	B	121	129	250

Failures from All Causes.

Apparatus.	Experiment Commenced.	No. of Nights.	No. of Actuations.	Failures from All Causes.	Rate per Cent. of Failures on Actuations.	No. of Lamps Lighted.	Rate per Cent. of Failures on Lamps Lighted.
Bamag	Nov. 8, 1909	365	273,750	684	0.24	91,250	0·74

The following table gives the description and number of failures at lighting and extinguishing time.

Bamag Apparatus.	Bye-Pass.	Shortage of Pressure.	Service Choked.	Apparatus out of Order.	Irregular Operations.	Lever Thrown Over.	Unknown Causes.	Total.
Failures at lighting time	156	—	70	6	55	—	66	353
Failures at extinguishing time. .	—	2	84	72	115	6	52	331
Total. . . .	156	2	154	78	170	6	118	684
Rate per cent. of failures on 273,750 actuations . . .	0·05	—	0·05	0·028	0·06	—	0·04	—
Rate per cent. of failures on 91,250 lamps lighted . .	0·17	—	0·16	0·085	0·18	—	0·12	—

Apparatus only:

On actuations, 0·028 per 100 = 1 lamp per 3571
On lamps lighted, 0·085 per 100 = 1 lamp per 1176

Apparatus.	On Lamps Extinguished at				Total.		Average Saving per Lamp.	
	Midnight.		Daybreak.					
	Hours.	Mins.	Hours.	Mins.	Hours.	Mins.	Hours.	Mins.
Bamag	1747	8	131	30	1878	38	939	19

GAS COAL AND COKE FROM GERMANY.

In the "Iron and Coal Trades Review" for the 30th ult., reference was made in a leading article to the purchase by the Gaslight and Coke Company, from the Westphalian Syndicate, of a consignment of gas coal. Though a great deal was made of this matter at the time, as it was regarded by many as a lesson to Free Traders, our contemporary pointed out that the order actually placed was for not more than 10,000 tons, compared with an annual consumption of upwards of 2,000,000 tons. The writer went on to say: "It is true that the occurrence proves the possibility of importing German coal into England under certain circumstances and in comparatively small quantities. But it has been done before without causing any great upheaval in this country, while for some time past a few British iron and steel works have been using a proportion of German coke without the circumstance being regarded as sensational. . . . The foreign invasion cry is altogether a transparent kind of scare so far as coal is concerned. We have heard of it before, and shall probably hear of it again in due course. But the fact remains that during the first eleven months of 1909 we imported only 32,000 tons of coal, coke, and patent fuel, according to the official Board of Trade returns. It is true that the Germans are able to transport their coal cheaply in barges down the Rhine, and it may be that the same craft might convey the cargo all the way to the Thames without transhipment, if necessity arose. But even if British competition failed to prevent the regular importation of some thousands of tons of German coal annually, it should be remembered that we send to Germany about 9 million tons every year; so that we have a very large balance on the right side. Moreover, the quality of the German product is not always reliable; and despite the water-gas plants and the oil-enrichment processes, quality is still important in the gas industry as elsewhere."

The subject of the importation of German coke into this country for use in iron-works was dealt with in a leading article in our contemporary on Friday last. The writer made the following remarks: "We learn that a substantial contract for coke, amounting to about 10,000 tons in all, has been placed in Germany by a British iron and steel company for delivery on the west coast over the whole of this year. The price is not disclosed; but we presume it compares favourably with that demanded for the British product. Though gas coke is still scarce, furnace and foundry qualities have declined in value of late. Durham foundry can be bought at 16s. 6d. per ton f.o.b. Dunston; while for the very best no more than 17s. 6d. is quoted. The Germans are doubtless a very businesslike and enterprising people; but it seems curious that they should be able to send to our shores, in competition with British makers, a commodity which we produce so plentifully and so cheaply, seeing that they have the disadvantage of geographical position to face, involving as it does railway and ocean freight rates. There may have been some special circumstances in this particular case, the details of which have not come to light. . . . After all, 10,000 tons is but a drop in the ocean as compared with our total consumption of coke, or with our exports, which alone amount to over a million tons annually; and we do not foresee any extensive suspension of operation at British coke-ovens as a result of the German order to which we have referred, or of further German competition in this country, notwithstanding the formidable character of the Westphalian Syndicate and its organized and persistent efforts in all quarters to secure business."

Harrington Gas-Works Purchase.—The Harrington (Cumberland) Urban District Council have decided to offer the local Gas Company £7100 for their undertaking, subject to the Council obtaining the necessary parliamentary powers to purchase.

Fulwood Water Supply.—Last Thursday, Dr. A. W. Brightmore, M.Inst.C.E., one of the Local Government Board Inspectors, held an inquiry at the offices of the Fulwood Urban District Council into an application of the Council for a Provisional Order to amend their Acts, so as to make applicable to their water undertaking certain provisions of the Public Health Act, 1875. The effect of the application, if it is granted, will be that the Council will be able to lay a 12-inch main from the service reservoir at Haighton to Fulwood. Mr. Arnold Brierley, the Clerk and Solicitor to the Council, explained the nature of the amendments required in the Local Acts to enable the Council to carry out their proposals; and Mr. A. E. Coupe, the Surveyor, dealt in detail with the plans and estimates. The sum required to carry out the works, which include a screen in the filter chamber, is £10,600.

Stand-by Charges at Stockport.—At the monthly meeting of the Stockport Town Council last Wednesday, the subject of the charges for stand-by supplies of gas was brought forward. The Gas Engineer (Mr. S. Meunier) had reported to the Gas Committee upon the practice in this respect in other towns, and it was resolved that the resolution adopted by the Committee last August, fixing a minimum charge, equivalent to 20 per cent. of the cost of the installation from the main, in all cases where gas is laid on as a duplicate or stand-by supply, be rescinded, and that the Engineer prepare a scale of charges in accordance with his suggestion, based upon the capacity of the meter. This was done; and at a subsequent meeting, the following scale was approved: Where the capacity of the meter is above 10 lights and under 20, 5s.; above 20 and under 50, 7s. 6d.; above 50 and under 100, 10s.; above 100 and under 150, 12s. 6d.; above 150 and under 200, 15s.; above 200 and under 250, 17s. 6d.; above 250 and under 300, 20s.; above 300 and under 350, 22s. 6d.; above 350, 25s.

BIRKENHEAD WATER SCHEME.

Tender Accepted.

At the meeting of the Birkenhead Town Council last Wednesday, the minutes presented by the Water Committee contained a recommendation that the tender of Messrs. Robert M'Alpine and Sons for the carrying out of the works in connection with the removal of peat from the site of the proposed Alwen reservoir, and the construction of the reservoir and masonry dam, embankments, &c., in accordance with the drawings, specification, and bill of quantities prepared by the engineers, for the sum of £186,153, be accepted, subject to the execution by them of a contract in the form approved, and to a guarantee in the sum of £20,000 for its due performance.

Alderman BLOOR, moving the confirmation of the minutes, said the Council would remember that in August last the Committee asked permission to invite tenders for the work referred to. Tenders were asked from twelve firms; and on the 4th of October nine were received. It was found that the tender of Messrs. Robert M'Alpine and Sons was the lowest, amounting to £160,028; while the estimate of their own engineers was £161,390, or £1362 in excess of the lowest tender. The next lowest amounted to £219,197, or £59,159 above Messrs. M'Alpine's tender. Under these circumstances, the Committee referred the tenders to their experts for examination and report. The examination was made by Sir Alexander Binnie, their Engineer, and others; and they reported favourably of Messrs. M'Alpine and Sons' tender. The Committee realized that this matter was one of more than ordinary importance, and the amount between the lowest tender and the next was also so considerable that it was necessary that the fullest inquiry should be made with regard to Messrs. M'Alpine. This was done; and the Committee were then quite satisfied that they would be justified in entrusting the work to the firm. They did not, however, settle the matter on that occasion. The following morning, one of the firm met the Town Clerk (Mr. J. Fearnley), and, much to his surprise, told him that since sending in the tender they had discovered they had made a mistake with regard to a certain part of it, which necessitated an alteration. The work resolved itself into two parts—the removal of the peat and the construction of the dam. The former was perhaps the most important part of the contract. The firm had contemplated that they would be able to dispose of the peat by some method of their own; but their experiments had not concluded at the time they had to send in the tender. They found that the method they proposed was impracticable, and could not be acted upon. They calculated that the removal of the peat would cost 1s. per cubic yard; but they told the Town Clerk that they would have to increase this price by 6d. a yard owing to their mistaken theory. A long letter was sent to the Town Clerk explaining the matter, and Messrs. M'Alpine asked leave to amend their tender or be allowed to withdraw it. He need hardly say this was a surprise and a great disappointment to the Committee; and it devolved upon them to see what action should be taken. They had an interview with members of the firm, who gave the fullest explanation they could, and expressed their great regret at having to make an alteration in the tender. The Committee found, however, that with the 6d. per cubic yard added Messrs. M'Alpine's tender was still considerably below the next lowest tender on the list; there being a difference of more than £33,000. While the Committee were very disappointed at the course the matter had taken, they were prepared to advise the Corporation to pass the resolution submitted to them. He thought the Council would be badly advised to throw away the difference between the amended tender and the next lowest on the list. He further proposed that Mr. J. H. Parkin be appointed Resident Engineer. The contract to be entered into stipulated that the work must be completed in four years.

Alderman B. JONES seconded the motion.

Mr. T. L. DODDS said, after the clear statement made by Alderman Bloor, they could not hesitate in accepting his advice. He thought the contract was one favourable to the Corporation; and they only wished the work might be completed with the satisfaction for which they all hoped.

Alderman B. JONES pointed out that if the amount of the amended tender had been the total of the original one, the firm would still have obtained the contract, as they were £33,000 below any other. He thought the Council would be wise in accepting the contract, and they need not fear the result.

The motion was carried.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Scottish Junior Gas Association—Eastern District—held a most successful and profitable meeting in Dundee this afternoon. There was a splendid attendance. It has been known that the Dundee Corporation Gas Department have introduced, as part of their regular distributing system, plant for giving a high-pressure supply in the irregularly hilly district to the north of the city. Many members went to see this latest addition to the extending practice of supplying gas at higher pressures than have hitherto been regarded as either permissible or advisable. The members were invited to see the boosting plant at the gas-works; and this, with a sand-blast apparatus for cleaning gas-stoves, formed a source of attraction to them. The high-pressure plant was described in the meeting by Mr. J. Mitchell, lately of Ardrossan, now Assistant-Manager at Dundee—a son of the late Mr. R. Mitchell, of Edinburgh. Mr. Mitchell is a young man of great promise. He gave an excellent account of what the installation is like, and what it does; and he was very deservedly complimented by his fellow-members upon his first essay in the reading of papers. Mr. A. Yuill, the Engineer at Dundee, gave, as he did on the last occasion when the Association visited Dundee, a very thoughtful address, in which he particularly emphasized the value to a gas manager of the study of commercial conditions. The meeting is another proof of the wisdom of the Eastern District in holding some of their meetings away from home so to speak.

The Kirkcaldy gas arbitration, which opens in Edinburgh on Monday, is the principal theme of conversation in gas circles. It is interesting to note that Mr. Corbet Woodall, who is nominated by the Gas Company as Arbiter on their behalf, occupied a similar position in the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,863	Stk.	Oct 14	5	Alliance & Dublin Ord.	80–83	..	6 0 6
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	95–98	..	4 1 8
200,000	5	Oct. 28	7	Bombay, Ltd.	6⅞–7¼	..	5 1 10
40,000	5		7	Do. New, £4 paid	5–5¼	..	5 6 8
50,000	10	Aug. 31	15	Bourne-mouth Gas and Water: 10 p.c.	28½–29½	..	5 1 8
311,810	10	,,	7	B 7 p.c.	16½–16⅞	..	4 3 7
75,000	10	,,	6	Pref. 6 p.c.	14⅞–15¼	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253–256	+1	4 17 8
330,000	,,	,,	9⅜	Do. New	195–198	+2	4 16 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98 100	+1	4 0 0
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	217–220	..	5 0 0
246,320	,,	,,	8	Do. A Ord. Stk.	158–161	..	4 19 5
460,000	20	Sept. 29	10⅜	British	44–45	..	4 12 4
109,000	Stk.	Aug. 14	6	Bromley, A 5 p.c.	119–121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c.	89–91	..	4 18 11
82,278	,,	,,	5⅛	Do. C 5 p.c.	109–111	..	4 19 1
55,000	,,	Dec. 30	3⅛	Do. 3½ p.c. Deb.	83–85*	..	4 2 4
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95–97*	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	3–4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4⅜–5⅛	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4⅛	Do. 4½ p.c. Deb. Stk.	88–90*	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	109½–111½	..	4 9 8
1,513,280	Stk.	,,	5 5/16	Commercial 4 p.c. Stk.	107–110	+1	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do.	101–103	..	4 17 1
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77–79	..	3 15 11
800 000	Stk.	,,	4	Continental Union, Ltd.	86–91	..	4 7 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	134–136	..	5 2 11
492,270	Stk.	—	5½	Derby Con. Stk.	122–124	..	4 8 9
53,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103–105	..	4 15 3
486,090	10	July 14	12	European, Ltd.	23⅜–24½	..	4 19 0
354,060	10	,,	12	Do. £7 10s. paid.	17⅝–18½	..	4 18 8
16,179,445	Stk.	Aug. 12	4⅜	Gas light and Coke: 4 p.c. Ord.	106–107	+½	4 7 2
2,600,000	,,	,,	3½	3½ p.c. max.	86–88	..	3 19 7
4,062,235	,,	,,	4	4 p.c. Con. Pref.	103–105	..	3 16 2
4,331,705	,,	Dec. 15	3	3 p.c. Con. Deb.	78–80	..	3 15 0
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	93–95	..	5 5 3
82,500	,,	,,	6⅛	Do. do. 5 p.c.	114–116	..	5 12 1
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17–17⅛	..	6 5 8
131,000	Stk.	Sept. 15	7⅜	Ilford A and C	146–149	..	4 19 0
65,780	,,	,,	5⅝	Do. B	115–117	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	95–98*	..	4 1 8
4,940,000	Stk.	Nov. 11	9	Imperial Continental	185–187	..	4 16 3
1,235,000	Stk.	Aug. 12	3⅛	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	121–123	..	4 17 7
561,000	Stk.	,,	10	Liverpool United A.	220–222	..	4 10 1
718,100	,,	,,	7	Do. B	164–165	..	4 4 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.	102–104*	..	3 16 11
75,000	5	Dec. 15	6	Malta & Mediterranean	4⅜–4⅝	..	6 3 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	100–102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	+1	4 8 3
541,920	20	Nov. 11	3⅛	Monte Video, Ltd.	12¼–12⅝	..	5 9 10
1,775,892	Stk.	July 28	4⅜	Newc'tle & G'tesh'd Con.	101½–102⅜	..	4 5 4
529,435	Stk.	Dec. 30	3⅛	Do. 3½ p.c. Deb.	89–90*	+1	3 17 9
55,940	10	Aug. 31	7	North Middlesex 7 p.c.	13⅜–14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	137–139	..	5 15 1
60,000	5	Sept. 15	8	Ottoman, Ltd.	6¼–6⅝	..	5 18 6
31,800	53	Aug. 31	13	Portsea Island A.	132–134	..	5 2 4
60,000	50	,,	13	Do. B.	125–127	..	5 2 4
100,000	50	,,	12	Do. C.	118–120	..	5 0 0
114,800	50	,,	10	Do. D and E.	103–105	..	4 15 3
398,490	5	Oct. 28	7	Primitiva Ord.	7¼–7½	..	4 13 4
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5⅜–5⅝*	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95–97	..	4 2 6
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	95–97*	..	4 2 6
250,000	10	Sept. 29	9	San Paulo, Ltd.	15¼–15⅝	..	5 14 3
115,030	10	,,	6	Do. 6 p.c. Pref.	11¼–11⅝	..	5 2 2
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50–51*	..	4 18 0
135,000	Stk.	Aug. 31	10	Sheffield A	229–231	..	4 6 7
209,984	,,	,,	10	Do. B	229–231	..	4 6 7
523,500	,,	,,	10	Do. C	229–231	..	4 6 7
70,000	10	Oct. 14	6	South African	10½–11¼	..	5 6 8
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.	121–123	..	4 8 10
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	80–82	..	3 13 2
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	155–157	..	5 1 11
605,000	Stk.	Aug. 12	5⅝	S'th Suburb'n Ord. 5 p.c.	120–122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122–124	..	4 0 8
502,310	Stk.	Nov. 11	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham and Edmonton: A 5 p.c.	141–143	..	4 17 11
483,940	,,	,,	5⅛	B 3⅜ p.c.	113–115	..	4 15 8
149,470	,,	Dec. 15	4	4 p.c. Deb.	95–97	..	4 2 6
182,380	10	Dec. 30	8	Tuscan, Ltd.	8⅝–9¼*	..	8 13 0
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	96–98*	..	5 2 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.	114–115	..	4 6 11
253,636	Stk.	Aug. 31	6⅝	Wands-worth: B 3⅜ p.c.	142–144	..	4 13 7
85,766	,,	Dec. 30	3	3 p.c. Deb. Stk.	73–75*	..	4 0 0

Prices marked * are "Ex. div."

arbitration in connection with the Falkirk transfer in 1894. On that occasion, with a yearly output of gas of 52 million cubic feet, the claim on behalf of the Company was for £111,000 or thereby. Since then, the annual output of gas in Falkirk has increased to 196 millions. In 1895, the output in Kirkcaldy was 83 million cubic feet; it is now 148 millions. The claim of the Kirkcaldy Company is for a payment of £224,000. If a further comparison may be stated, it is that in Falkirk the capital was £69,000 in 1895, and is now £205,000; in Kirkcaldy, the capital in 1895 was £40,000, and is now £65,335. It will be observed from a report in another column that the Corporation accuse the Company in one breath of having inflated their capital, and in another breath of having paid away large sums to shareholders over and above what they were entitled to. The somewhat inconsistent position may be explained as meaning that the Company did not issue sufficient capital, but extended their works out of revenue, then capitalized the outlay and paid dividend upon it. This policy is put forward by the Corporation as a reason why the Company should get a small price. By the Company, the smallness of the capital is treated as a reason for giving a high price. This will probably be the most serious matter to decide in the arbitration; and it is trammelled by the question about the agreement of 1845, which has been dragged in by the Corporation. But it is just possible, and not unlikely, that the Arbiters may, at an early stage, give their opinion as to whether the agreement of 1845 is or is not still binding; and in the event of their deciding that it is not, the way for the remainder of the arbitration would be much easier. It is, on many grounds, regrettable that the parties were not able to come to terms.

During the night between Thursday and Friday of this week, large areas in the eastern district of Edinburgh were pervaded by fumes of an offensive odour, which were almost universally regarded as emanating from the gas-mains. A description of the odour given in one of the city newspapers was as follows: "A compound of gas, ammonia, sulphuretted hydrogen, and generally a composition of sewer and coal gas." Employees of the Gas Commission were called out, and worked the whole night in an endeavour to detect anything wrong with the gas-mains. The area affected extended for several miles; so that any defect which might have been discovered must have been a serious one. No defect was found; and the conclusion come to by the gas officials, which was acquiesced in by the Burgh Engineer, was that it was either sewer gas or was the result of a discharge, either accidental or surreptitious, of objectionable matter from industrial works. The Medical Officer of Health maintains that the fumes could not have been sewer gas, as it is odourless. In his opinion, there is somewhere an escape of coal or acetylene gas which has found its way into the sewer. The fumes passed away in an hour or two, and have not since been perceived. Their origin is still a mystery.

In the Kirkcudbright Town Council last week, the Gas Committee reported that a gas-meter had been sent to Messrs. Alder and Mackay, of Edinburgh, to be tested, and that they reported that it registered 5·20 per cent. slow, when working at its normal quantity, and that it might pass 4 cubic feet per hour without registering. The Council, on this report, resolved to insist upon payment of the consumer's account whose meter had been tested. The Gas Convener reported that a setting of retorts would require to be renewed this year, and that the Manager recommended the installation of four retorts upon the Waddell system.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 118.]

LIVERPOOL, *Jan.* 7.

Sulphate of Ammonia.

During the past week, the exceptional firmness of the position has become more accentuated, and a large amount of buying has taken place at rapidly increasing values. There has been a fair number of new orders on the market; but the greater portion of the demand has been for covering previous sales—dealers having now apparently made up their minds to secure their requirements without delay. The closing quotations for prompt delivery are £13 1s. 3d. to £13 2s. 6d. per ton f.o.b. Hull, £13 2s. 6d. to £13 3s. 9d. per ton f.o.b. Liverpool, and £13 5s. to £13 6s. 3d. per ton f.o.b. Leith. At the commencement of the week, £13 per ton f.o.b. Leith was accepted for equal monthly quantities January-June; and the same figure was paid f.o.b. Liverpool for January-March. Later, however, a further 2s. 6d. per ton was conceded over these periods; and makers generally are now holding for £13 5s. per ton.

Nitrate of Soda.

Although no further advance has to be recorded in the price of this article, the market continues very firm; the quotations still being 9s. 6d. per cwt. for 95 per cent., and 9s. 9d. for refined quality, on spot.

LONDON, *Jan.* 9.

Tar Products.

The markets for tar products have been very firm during the past week. Pitch has been very steady, and there has been a further improvement in prices. Considerable business has been done at the increased figures at nearly all ports. Creosote remains in about the same position as before. Benzols are steady; and there is not much new business in solvents. Crude carbolic acid is of little interest.

The average values during the week were: Tar, 18s. 3d. to 23s. 3d., *ex* works. Pitch, London, 37s. to 37s. 6d.; east coast, 36s. 6d. to 37s.; west coast, Clyde, 36s. to 37s., Manchester, 36s. 6d. to 37s., Liverpool, 37s. to 38s. Benzol, 90 per cent., casks included, London, 8¼d. to 8¾d.; North, 8¼d. to 8¾d.; 50-90 per cent., casks included, London, 8¼d. to 8½d.; North, 8d. to 8¼d. Toluol, casks included, London, 9½d.; North, 9d. Crude naphtha, in bulk, London, 3¾d. to 4¼d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included.

Davis's Steamless Radiator.

New Year Resolutions.

Resolve

to support the Steamless Radiator throughout 1911 because of the following noteworthy facts regarding it.

MERIT has won for the "Steamless" a unique place among heating apparatus. It is the only Gas-Heated Radiator giving uniform distribution of heat *(owing to its patented principles)* without steam, without hot water, without liquid of any kind.

EXTREME SIMPLICITY abolishes Water Receptacles, Gauge Glasses, Valves, Complications of every kind.

There is NO FLAME CONTACT with any solid part of the Radiator — result, *complete combustion*. The "Steamless" produces an agreeable moist heat.

All its claims are backed up by a THREE YEARS' GUARANTEE.

The DAVIS Gas Stove Co. Ltd. Luton

Show-Room Addresses { **City Offices: 59, Queen Victoria Street, E.C. ('Phone: 742 Bank.)**
Manchester: 4, Victoria Arcade, Deansgate. ('Phone: 4689 City.)
Paris: 82, Rue D'Hauteville.

London, 11⅜d. to 1s.; North, 11d. to 1s. Creosote, in bulk, London, 2 5/16d. to 2 7/16d.; North, 1⅝d. to 2d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1½d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been very firm, and prices have improved at all ports. Considerable buying has been done, no doubt to cover-in contracts made some time ago. Actual Beckton is now quoted at £12 12s. 6d. Outside makes on Beckton terms are £12 8s. 9d. to £12 10s. At Leith, there is very little offering for near delivery; and for forward, £13 5s. is quoted. In Hull, £12 18s. 9d. to £13 is asked; in Liverpool, £12 17s. 6d. to £13; and in Middlesbrough, £12 18s. 9d. to £13.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a fuller production of coal at the north-eastern collieries; and as steamers are more plentiful, the shipments are about normal. In the steam coal trade, best Northumbrians are from 9s. 9d. per ton f.o.b. for prompt delivery, with a slightly lower price for forward delivery. Second-class steams are 8s. 6d., and steam smalls from 5s. to 6s. 6d. per ton. Work at the pits is now more full; but the inquiry is not very pressing. In the gas coal trade, the demand is active, as is usual at this season, and it is now amply met; the production being heavy. Durham gas coals vary from 8s. 6d. to 9s. 4½d. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," up to 10s. 6d. is quoted—the latter kinds being still rather scarce. There are some small contracts for gas coal at present in the market; but they are not likely to influence the prices very much, as the heavy contracts are now fixed, and certain of the collieries are inclined to ask for higher prices. In coke, the market is steady. Gas coke is firm at about 14s. 6d. per ton f.o.b.; the output being well taken up, though it is nearly at its largest.

Scotch Coal Trade.

There is no market report for the past week. The quantity of coal shipped was stated to have amounted to some 358,754 tons—an increase of 29,601 tons upon the previous week, and of 58,783 tons upon the corresponding week last year. In the year 1910, the total quantity of coal shipped amounted to 16,296,054 tons—an increase of 873,828 tons over 1909.

The Leeds City Council have adopted a minute of the Water Committee receiving the resignation of Mr. E. W. Terrey, Chief Assistant in the Engineer's office, on his recent appointment as Engineer to the Pontypridd and Rhondda Valley Water Board, and asking the Sub-Committee to report on the means of filling the vacancy.

Calendars, Blotting-Pads, &c.

In addition to the diaries, &c., acknowledged last week, we have received others from the following firms.

Thomas Cash and Co., Birmingham.
R. & A. Main, Limited, London and Edmonton.
Mobberley and Perry, Limited, Birmingham.
Parkinson and W. & B. Cowan, Limited (Parkinson Branch), London and Birmingham.
Peckett and Sons, Bristol.

Work and Wages at Nottingham.—The Nottingham City Council have agreed to the recommendations of the Special Committee (which were referred to last week, p. 16), with regard to a resolution passed a year ago expressing the opinion that the workmen should have one day's rest in seven, and also with regard to the payment of a minimum wage of 5½d. per hour, with certain exceptions.

Rochdale Street-Lamp Cleaners.—At their last meeting, the Gas Committee of the Rochdale Corporation considered a letter from the Gas Workers' Union, applying for better conditions for the street-lamp cleaners. It seems that there are about 3000 lamps to be attended to; and the Union asked for the appointment of three additional hands to cope with the growing work. It was also suggested that the men employed to put on mantles should take a share in the cleaning. Consideration of the matters was referred to the Works Sub-Committee.

Street-Box Explosion.—Pedestrians in the vicinity of the Convent of the Good Shepherd in Fulham Palace Road were startled about six o'clock last Wednesday evening by a series of sharp explosions proceeding from the underground electric cable belonging to the Hammersmith Borough Council. The wife of a tramway conductor was walking over the manhole just as the cover was blown off, and bursts of flame were emitted. She fell heavily on to the pavement, and sustained severe injuries to her head, which necessitated her detention at the West London Hospital. Other pedestrians suffered from shock.

Assessment of the Falmouth Water-Works.—At the Bodmin Quarter Sessions last week, his Honour Judge Granger, the Chairman, gave judgment in the appeal of the Falmouth Water Company against the assessment of their undertaking by the Assessment Committee of the Falmouth Union. It was heard at the previous Sessions, and reported in the "JOURNAL" for Nov. 1 last. His Honour said the appeal was against the assessment of the portion of the works which was in three parishes of the Union, and also against the apportionment of the whole of the parishes. The Court had no difficulty in coming to the conclusion that the apportionment was right; but they reserved their decision in order to see if the deductions made by the Assessment Committee were correct. Having carefully read the shorthand notes, they had come to the conclusion that this was so; and the appeal would therefore be dismissed, with costs.

Interchangeability!

THE Combined Patent Duplex Tap and Gas-Air Adjuster is a cardinal feature of the "A.B.C." Series of Gasfires, an innovation achieved without alteration to structural parts.

Sales Departments should bear in mind the enormous advantages that this addition affords, and during the cold months of January, February, and March induce their consumers to instal these Gasfires.

Vide The "Gas Journal" 20th September, 1910:—

" . . . . Every fire is interchangeable one with the other, which is a feature of such popularity, convenience, and economy to gas suppliers. Its value . . . . is such that it cannot be over-estimated from the maintenance standpoint."

THE RICHMOND GAS STOVE & METER CO., LTD.,

Gasfire Specialists,

WARRINGTON, and 132, Queen Victoria Street, LONDON, E.C.

Explosives Found Near the Beckton Gas-Works.

Considerable publicity was given last Wednesday to an alarmist story as to the finding of explosives near the Beckton Gas-Works; the event being associated with the Anarchist outrages which have lately come into such prominence in East London. Information obtained from official sources, however, at once dispelled the idea. Among the vessels carrying coal to the gas-works was one named the *Seaham Harbour;* and on Christmas Eve it was lying off the works. One of the officers had been ashore, and when he was returning to the vessel he was attracted by the sight of a quantity of brownish-coloured jelly, which, on being touched, was seen to be tubular, like macaroni. The material was scattered about the ground within a small area. He collected most of it, and conveyed it to the vessel, where it was recognized as "blasting gelatine," and some of it was thrown overboard. The rest was taken to the North Woolwich Police Station, and subsequently removed to the Royal Arsenal at Woolwich, where it was analyzed. The police were apprised of the result of the analysis; and the conclusion come to was that the stuff had been thrown away as useless by someone who had stolen it from the Royal Albert Docks.

Korean Water-Works, Limited.—The ordinary general meeting of this Company was held last Thursday week—Mr. G. Cawston presiding. The Chairman said that negotiations were proceeding with a Japanese group of financiers, and the Directors hoped that the sale of the property would soon be completed, and the proceeds divided, as had been decided upon at a recent meeting (reported in the "JOURNAL" for Dec. 27). Another meeting would be necessary; and when this was held, resolutions would be put forward to wind-up the Company and appoint a Liquidator. Of the £40,000 of the prior lien debentures created in June, 1909, for the purpose of providing funds for the Yungsan extension, &c., they had, at the date of the accounts (May 31 last), issued £5772; and up to the present time the amount was £9287.

Lamplighters as Price-Cutting Window Cleaners.—A deputation from the Window Cleaners' Federated Associations who recently waited upon the members of the Manchester Corporation Gas Committee had to complain that lamplighters in the employ of the Corporation not only utilized their spare time in window cleaning, but do the work at a price which is much lower than that charged by the "professional" window cleaner. It was also alleged that the lamplighters frequently use the Corporation's ladders, buckets, and leathers in this work; and the deputation asked that the Committee should put a stop to the practice. The Committee decided to give instruction to the lamplighters in the service of the Corporation not to use in their private work articles belonging to the Corporation, under pain of instant dismissal. The Committee have also issued a notice strongly deprecating the practice of their servants undertaking to do work in competition with the Window Cleaners' Federated Associations at prices alleged to be below the standard charges of these Associations.

Bakewell Gas-Main Extension.—The Bakewell Urban District Council have resolved to extend their gas-main to the village of Ashford-in-the-Water, so as to give that place, which is now lit by oil-lamps, a supply of gas. In view of this work, the Council decided not to make any reduction in the price of gas at the present time.

Gas Question at Holmfirth.—A settlement appears to be in sight of a question which has been under discussion between the Holmfirth Urban District Council and the Gas Company. Some time ago, the Company pointed out to the Council that the meters of the public lamps did not register the gas passing through the bye-passes; and they charged a small percentage for the gas unregistered. This the Council refused to pay. The Company next raised the price from 3s. 1d. per 1000 cubic feet to 3s. 4d. The Council replied by taking steps towards providing an electric supply. The Company have now written to state that an Edinburgh firm offer to supply meters that will register all gas consumed; and the Company propose to substitute the new meters and revert to the former price. The Council have agreed to the change, providing the Gas Company change the meters at their own expense.

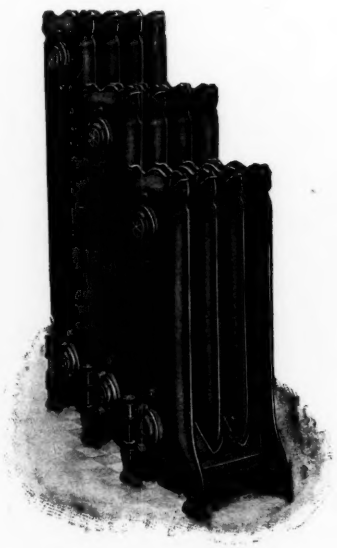
Gas Supply in Toronto.—According to the report of the Consumers' Gas Company of Toronto for the year ended the 30th of September last, the total gross earnings amounted to $2,070,961 (about £414,192) compared with $1,737,766 (about £347,553) in the previous year—an increase of $333,195 (£66,639.) The output of gas for the year showed an increase of 395,084,000 cubic feet, or 17·74 per cent.; the total being 2,621,247,000 cubic feet, compared with 2,226,163,000 cubic feet before. During the year, 29 miles of pipe were laid, bringing up the total length to 423 miles. The number of new services put in was 6268. The Company's business has developed so rapidly that contracts have been let for a new plant of 3 million cubic feet capacity. Among the successful contractors are West's Gas Improvement Company, Limited, for charging and discharging machines and an extension of the conveyor system; Messrs. Drakes Limited, for scrubbing and condenser plant; and Messrs. Waller and Son, for exhausters.

Bilston Gas Company.—Moving the adoption of the report at the annual meeting of the Bilston Gas Company, Mr. H. Holcroft said the statement was satisfactory in every way for the shareholders. The chief feature of the year's working had been the necessary replacing of worn-out plant. The expense, however, had been only in connection with replacements and repairs, and not extensions. At the present moment he was of opinion that the works were adequate for the requirements of the district. The sales of gas constituted a good barometer; and he thought there was not much probability of additional provision for increased output being made for some time. The continuation of prudent management would find the Company in as sound a position as they had occupied for years past. The sales of gas, he added, had been increased about 2 per cent. The report was adopted; and the proposed dividends of 5s. 6d. per share on the "A" shares and 4s. per share on the "B" shares (making, with the interim dividends, 11s. and 8s. per share respectively for the year) were authorized.

A "MAIN" MOTTO

"If it were done, when 't is done then 't were well it were done quickly."

(So said Shakespeare)



An important point to be considered in Radiators is their ability, or inability, to raise heat quickly.

RADIATORS WITHOUT AUTOMATIC VALVE OR WITH SO-CALLED REGULATING VALVES EITHER CANNOT RAISE HEAT QUICKLY, OR, IF THEY DO, THEY CANNOT MAINTAIN IT ECONOMICALLY.

Our Radiators raise required heat IN THE SHORTEST POSSIBLE TIME.

Our Patent Automatic Valve then ensures the maintenance of this heat with THE MINIMUM GAS CONSUMPTION.

The longer the Radiator is in use THE GREATER IS THE ECONOMY EFFECTED IN COMPARISON WITH OTHER RADIATORS.

OUR VALVE enables the Radiator to adapt itself to circumstances.

R. & A. MAIN, LIMITED,

WORKS: Gothic Works, EDMONTON, N.; and Gothic Ironworks, FALKIRK.

SHOW-ROOMS: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; and 13, Whitworth Street West, MANCHESTER.

St. Petersburg Water Supply.—Sir Alexander Binnie and his son, Mr. William Binnie, who have lately been in St. Petersburg for several weeks, in the course of which they visited Lake Ladoga in connection with the scheme for canalization and also for a new water supply for St. Petersburg, left the city on the 2nd inst. Sir Alexander and Mr. Binnie were invited by the Government to examine various projects and report upon them.

Cost of Opposition to the Standard Burner Bills.—The Health Committee has reported to the Tunbridge Wells Town Council that a letter was received from Messrs. Sherwood and Co., stating that the expenses of the joint opposition to the Gas Companies (Standard Burner) Bills have now been apportioned, and, as far as has been ascertained, the share of the Town Council will be £77 odd. Such apportionment is, of course, subject to adjustment after taxation. The firm also enclosed a note of their charges amounting to £21. The Town Clerk reported that the expenses incurred by the Town Council in addition to the above amounted to £9 16s. 2d.

Price of Coke at Cockermouth.—When the Gas Committee submitted a recommendation to the Cockermouth Urban District Council that the price of coke, for quantities of 2 cwt., to residents in the town, be reduced from 8d. to 6d. per cwt., Mr. Crone moved, as an amendment, that the price be reduced to 4d. for three months—his argument being that it was their duty to give the necessitous poor cheap coke. The Chairman (Mr. Stephenson) said he was against both the recommendation of the Committee and the amendment. They were there to conduct the gas-works on business lines; and it was their business to get the market price for all residuals. The market price was 8d.; and they ought to have it. They had no right to make any distinction between classes of people. As the minute stood, the richest man in the town could get coke at 6d. It was, however, ultimately agreed to reduce the price to 6d. per cwt.

Water Storage at Chester.—Alderman Egerton Gilbert, moving in the Chester Town Council the adoption of a recommendation of the Parliamentary Committee (which was agreed to) that the Town Clerk be authorized to obtain the services of Dr. Houston, Director of Water Examinations to the Metropolitan Water Board, and report to the Company and to the Corporation upon the proposed storage scheme of the Chester Water-Works Company at their joint expense, read an extract from a report presented to the Parliamentary Committee showing that the water-works proposals were on the right lines. He said, however, that both the Water Company and the Corporation desired to have the opinion of Dr. Houston before proceeding with the scheme. The water supply of the city was excellent at present; but the question was as to whether there was adequate storage, and the Water Bill would provide for this. If the scheme was carried out in accordance with the wishes of the Council, there would be a good supply of water for the city for a couple of generations, and there would be no need for the Corporation to avail themselves of the clauses in the Birkenhead Corporation Bill, under which the city could participate in the Birkenhead supply.

Hartley Wintney Water Supply.—The Hartley Wintney Board of Guardians have received the sanction of the Local Government Board for the borrowing of £858 and £136 for works of water supply for the parish. The Guardians have decided to invite tenders for the works at Warren Heath.

Portrush Water Supply.—The Portrush Urban District Council have had a notification from the Local Government Board that they have authorized the Commissioners of Public Works to issue £1000 to the Council, being a further instalment of a loan of £6500 sanctioned for the purpose of extending the water-works.

Separate Control for Gas and Electricity at Leicester.—The Leicester Town Council have adopted a Committee recommendation that the future control of the electricity supply, including the management and the administration of the buildings at Aylestone, should be delegated to the Tramways Committee, which in future will be styled the Tramways and Electricity Committee. The effect of this will, of course, be to eliminate the electric lighting department from the work of the Gas Committee.

Pontypridd and Rhondda Water Purchase.—The Pontypridd and Rhondda Joint Water Board met the Directors of the Pontypridd Water Company on Monday last week and completed the purchase of the Company's undertaking. The sum paid amounted to about £300,000, in addition to which the Board took over debenture stock to the value of £42,000. The meeting was held at the Council Offices, Pontypridd; and the Directors of the Company present included Dr. Biddle (Chairman) and Sir W. T. Lewis, Bart. A hearty vote of thanks was accorded to the Sub-Committee entrusted with the negotiations, for having brought them to a successful issue. A vote of thanks was also tendered to the Directors of the Company for the courtesy they had shown throughout the proceedings. Sir W. T. Lewis, in replying, said he hoped the new Board would be able to provide the inhabitants of the district with an ample supply of pure water.

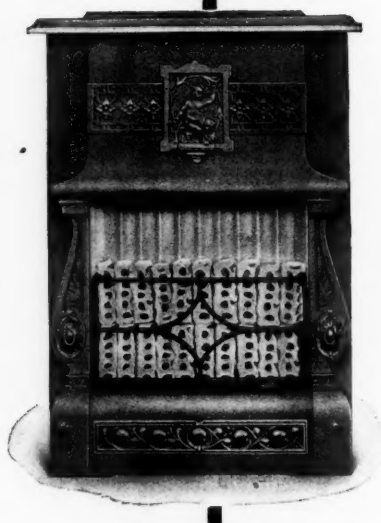
South Lincolnshire Water Company's Position.—This Company was formed about eighteen months ago with a capital of £20,000 in £5 shares, and £6000 of 4½ per cent. debentures; and it was stated in the prospectus that at the end of three years the Company would be supplying the principal parts of their districts, "and receiving the water revenues therefrom." The contractors for the works undertook, for a sum of £38,000, to pay all parliamentary and other costs of promoting the Company and raising the capital, to lay the mains, erect and equip a pumping-station, acquire the necessary lands, and finance the Company for three years. It now appears that they have notified that they cannot complete their contract, that the Directors have all resigned, and that a meeting of a few of the largest shareholders has been held at which a Committee was appointed. The Committee have issued a circular in which they ask all the shareholders to subscribe for more shares so as to raise £17,380 for the purpose of completing the works and paying debenture interest for the next three years.

CARRON

GAS FIRES

Give Satisfaction to Consumer and Gas Company alike because they combine the most modern ideas, are well fitted and finished, and are unique in design.

All Carron Fires are made with reversible connections right or left hand as desired.



CATALOGUES FREE ON REQUEST.

CARRON COMPANY
INCORPORATED BY ROYAL CHARTER 1759
CARRON, STIRLINGSHIRE.

Slough Water-Works Purchase Question.—Ratepayers of Slough having signified their approval of the action taken by their representatives on the Town Council, the Bill for the purchase of the water-works, of which notice has been given, is to be proceeded with. For a town of the size of Slough, this decision is a serious one, entailing as it does the spending of something like £100,000. But, guided by the advice of Mr. J. Diggle, the people of Slough feel that they are taking the right step, and have nothing to fear as to a burden being put upon the rates.

Lisburn Gas-Works Transfer.—In accordance with the terms of the agreement come to between the Lisburn Urban District Council and the Gas Company, as given in the "JOURNAL" for the 13th ult. (p. 795), the undertaking of the Company was transferred to the Council at the end of last year. To mark the occasion, the Chairman of the Council (Mr. H. M. Barbour), entertained a numerous company at dinner in the Town Hall on the evening of the 2nd inst. In proposing the toast of "The Chairman," the Town Solicitor (Mr. Young) eulogized the work done by Mr. Barbour during his two years' occupancy of the chair, and expressed much regret that he had decided to vacate it in the Coronation year. The toast of "The Gas Company" was responded to by Mr. Malcolm Gordon.

Power Gas Corporation, Limited.—The annual meeting of this Company was held last Tuesday—Sir Alfred Mond, Bart., M.P., presiding. In moving the adoption of the report, noticed last week, the Chairman congratulated the shareholders on the improvement shown in the profit. After payment of the proposed dividend of 4 per cent. on the ordinary shares, there would be £2122 to be carried forward. The Company's works had been well employed during the past year; and if trade continued good in 1911, he believed they would reap their share of the benefit. There had been one or two criticisms on the Board's policy of paying a dividend; but he thought it would be unreasonable to carry forward the whole of the large available balance. The report was adopted after a short discussion.

Manchester and the Smoke Nuisance.—A deputation from the Manchester and Salford Sanitary Association have waited upon the Manchester Corporation Gas Committee, to urge that something should be done speedily to mitigate the smoke nuisance, and to this end that gas should be supplied at the lowest possible figures, with the object of encouraging the use of gas-cookers, gas-fires, and other appliances. While the deputation were assured that the Committee would do everything in their power to reduce the price of gas with a view of inducing its use to the fullest extent possible, they were reminded that, while the Committee are required to pay a contribution of £50,000 a year towards the relief of the city rates out of the profits made from the supply of gas, there is very little likelihood of any reduction in price being made.

The Death of Mr. Rothwell.—An inquest was held last Wednesday by Mr. J. Troutbeck on the body of Mr. H. Rothwell (aged 47), whose death took place at Westminster Hospital under circumstances recorded in last week's issue of the "JOURNAL." It was stated that on the evening of the 5th ult. deceased was in the workshops of the London County Council Technical School at Vincent Square, Westminster, where he was engaged as an instructor, when he took a file from a student in order to show him how certain work should be carried out. The file, however, slipped, and Mr. Rothwell fell violently to the ground, fracturing one of his legs. He was taken to the hospital, where he died early on New Year's Day from failure of the heart, accelerated by the injury to the leg. The Jury returned a verdict of "Accidental death." The funeral service was held at Walham Green last Saturday afternoon. Mr. E. Pilbrow, the Inspector in Charge at Kensington, and other officials of the Gaslight and Coke Company, were among those who attended; and there were several wreaths from the different departments. The London and Southern District Junior Gas Association also sent a wreath, and were represented at the funeral service by their President, Mr. L. F. Tooth.

APPLICATIONS FOR LETTERS PATENT.

30,064.—CLEGG, W. H., "Internal combustion engines." Dec. 28.
30,066.—CHERRY TREE MACHINE COMPANY, LTD., and WOOLFALL, H. H., "Gas-irons." Dec. 28.
30,083.—SINCLAIR, R., "Gas-compressors." Dec. 28.
30,087.—GRAETZ, M., "Inverted gas-lamps." Dec. 28.
30,098.—GASNIER, M. L., "Periodical interruption of the flow of gases." Dec. 28.
30,136.—JULIUS PINTSCH AKT.-GES., "Alternate ignition and extinction of pilot-lights and main burners." Dec. 28.
30,161.—FIEDLER, R., "Producing long jets of flame." Dec. 29.
30,180.—HIRST, H., and CASH, F. T., "Shade-holder." Dec. 29.
30,189.—BARRETT, S. R., "Pipe-joints." Dec. 29.
30,194.—JOHNSON, J. Y., "Electrical purification of gases." A communication from Badische Anilin & Soda Fabrik. Dec. 29.
30,197.—DALEN, G., "Mixing gas and air." Dec. 29.
30,243.—LEASK, H. N., and HARRISON, F., "Fans or blowers." Dec. 30.
30,287.—TOOTH, L. F., "Regenerative furnace." Dec. 30.
30,291.—JULIUS PINTSCH AKT-GES., Lighting and extinguishing gas-lamps." Dec. 30.
30,295.—DELLWIK-FLEISCHER WASSERGAS G. M. B. H., "Gas-heated smelting or heating furnaces." Dec. 30.
30,302.—GLOVER, S., and WEST, J., "Discharging coke from continuously-operated vertical retorts." Dec. 30.
30,303.—CALDWELL, A. S., "Shades for lamps." Dec. 30.
30,304.—PEARSON, R. H., "Telpherage transporters." Dec. 30.
30,307.—MACIEJEWSKI, W., "Conduits." Dec. 30.
30,377.—PILLOUD, V., "Turbine water-meter." Dec. 31.
30,389.—DRAGERWERK HEINR and DRÄGER, B., "Joints." Dec. 31.

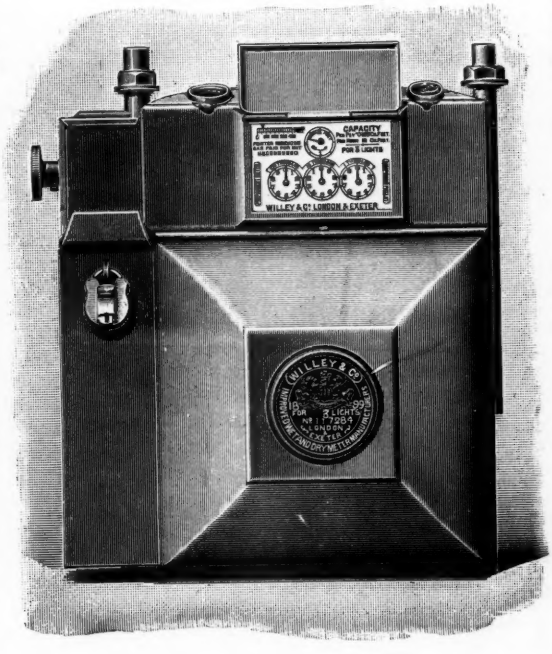
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

SHOW-ROOMS:

LONDON: 18, Adam Street, Adelphi, W.C.

DEVONPORT: 93, Fore Street.

AGENTS FOR SCOTLAND:

D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Messrs. George King Harrison, of Stourbridge, have secured the contract for supplying the retorts and fire-clay material required at the Bloom Street and Albion Street Gas-Works of the Salford Corporation during the ensuing twelve months. The tender of the Leeds Fire-Clay Company, Limited, has been accepted for a similar supply at the Liverpool Street works of the Corporation.

The Pontefract Town Council have resolved to lease their Electric Lighting Order to the Wakefield and District Light Railway Company, on payment of £300, with the option of purchase in twenty-one years at the then value. It was stated that the Order would expire shortly, and that unless steps were taken the Corporation would possess no *locus standi* to oppose the intervention of any speculative company.

It was mentioned in the "JOURNAL" for the 27th ult. that Thomas John Ambrose, the Secretary and Treasurer of the Equitable Slate Club at the Beckton Gas-Works, was charged, on his own confession, at the East Ham Police Court, with converting to his own use £44 16s. 7d., moneys of the club. He was brought up on remand a few days later; but the members did not wish to prosecute. The prisoner was, however, committed for trial.

The warrants have been posted for the dividend on the 6 per cent. preference shares of the Richmond Gas Stove and Meter Company, Limited, for the half year to Dec. 31, and for the interest on the 4 per cent. debenture stock for the same period.

The fiftieth anniversary of Messrs. E. J. & J. Pearson, Limited, fire-brick and retort manufacturers, of Brierley Hill, was commemorated on Dec. 27 and 28 by dinner parties given by the Directors to the staff and workpeople. At the earlier gathering, Major C. W. Thomas, who presided, gave an interesting sketch of the firm's history. The business was started in 1860 by Mr. E. J. Pearson, with Mr. John Pearson, jun.; and during its fifty years' existence there had been several changes in the proprietorship. At its inception it was not of great dimensions; but though there had been fluctuations, continuous progress had been made. The Company had four works and three pits; and they employed upwards of 300 people. Major Thomas also attended the second entertainment, and alluded to the good feeling subsisting between employers and employed. He mentioned that a good many of those present had been with the firm from thirty to forty years, and a still larger number from fifteen to twenty years.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CLERK OF WORKS. Oldham Gas Department. Applications by Jan. 16.
DRAUGHTSMAN. No. 5338.
LEAD BURNER. No. 5336.
WORKING FOREMAN. North Ormesby Gas Company. Applications by Jan. 14.

Situations Wanted.

ASSISTANT OR MANAGER. No. 5337.
FOUNDRY MANAGER. No. 5342.

Gas-Works for Sale.

Particulars from "R" Box, Erwood's Advertising Offices, Fleet Street, E.C.

Plant (Second Hand), &c., for Disposal.

EXHAUSTERS, ENGINES, PUMPS, BOILERS, PURIFIERS, COAL TRUCKS, TANKS, &c. Gaslight and Coke Company. Tenders by Jan. 20.

Plant (Second Hand), &c., Wanted.

TESI GASHOLDER. No. 5341.

Stocks and Shares.

B. GIBBONS, JUN., LIMITED. Particulars from W. P. Gibbons, Dibdale Works, near Dudley.
LOWESTOFT GAS AND WATER COMPANY. By Auction. Jan. 17.
SOUTHEND WATER COMPANY. By Auction. Jan. 17.
SOUTH-WEST SUBURBAN WATER COMPANY. By Auction. Jan. 17.
TENDRING HUNDRED WATER COMPANY. By Auction. Jan. 17.
YARMOUTH WATER COMPANY. By Auction. Jan. 17.

TENDERS FOR

Charging and Discharging Machinery, &c.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by Jan. 23.

Coal and Cannel.

BIRKENHEAD CORPORATION. Tenders by Jan. 19.
COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 14.

Condensers and Tanks.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by Jan. 23.

Elevating and Conveying Machinery, &c.

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by Jan. 23.

Fire-Clay Goods.

HEYWOOD GAS DEPARTMENT. Tenders by Jan. 14.
LEEDS GAS DEPARTMENT. Tenders by Jan. 21.

Gas-Generating Equipment.

BUDAPEST CORPORATION. Tenders by Feb. 28.

Oxide of Iron (Spent).

BIRKENHEAD CORPORATION. Tenders by Jan. 19.

Retort-House and Coal-Store (Pulling Down and Dismantling and Rebuilding, &c.).

SOWERBY BRIDGE GAS DEPARTMENT. Tenders by Jan. 23.

Sulphate Plant.

FORFAR GAS DEPARTMENT. Tenders by Jan. 13.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Jan. 7. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.	
					Liverpool.	Manchester.
Tar crude	per ton	22/6	19/6 22/–	19/9 22/6	19/9 21/9	19/9 21/9
Pitch	,,	38/–	36/3	36/6	36/– 37/–	36/–
Benzol, 90 %	per gallon	–/9¼ –/9½	–/9 –/9½	–/8	–/7½	–/8¼
Benzol, 50-90%	,,	–/10¼	–/10	–/9	–/8 –/8¼	–/8¾
Toluol, 90%	,,	–/10¼	–/9½	–/10	–/10	–/9¾ –/10
Crude naphtha, 30%	,,	—	–/3¼ –/3½	–/3½	–/3¼ –/3½	–/3½
Light oil, 50%	,,	—	–/3½	–/3½ –/3¾	–/3 –/3¼	–/3¼
Solvent naphtha, 90-160	,,	—	–/10½ –/11	–/10	–/10	–/11½
Heavy naphtha, 90-190	,,	—	–/11	–/11½	–/11½	–/11½
Creosote in bulk	,,	–/2¼ –/2¾	–/2 –/2¼	–/2	–/2	–/2 7/16
Heavy oils	,,	–/3¼	–/2½ –/3	–/2¼	–/2½ –/2¾	–/2¾
Carbolic Acid, 60's	,,	1/0½ 1/1	1/– 1/1	1/1	1/0½	1/0½
Naphthalene, crude drained salts	per ton	—	42/6 45/–	40/– 42/6	47/6	47/6 50/–
,, pressed	,,	—	60/–	63/–	60/–	60/– 72/6
,, whizzed	,,	—	—	—	65/– 72/6	60/– 75/–
Anthracene	per unit	–/2	–/1⅜	–/1½	–/1¼	–/1¼

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE)
ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
110, CANNON STREET, LONDON.

CORONATION, JUNE 22, 1911.

GAS Engineers should examine at once and send in to be put into thorough order all Gas Illumination Devices, as well as place orders for additional requirements with
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LONDON, GLASGOW, LEEDS.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.